nodes with information about which peers are directly connected and which other peers may be reached through bridging peers, if such connections are ever required. CX-721C (Madisetti RWS) at 8-9. As discussed above, the '004 reference also fails to disclose a setup connection.

The '004 reference does not disclose the fourth step of claim 1 of the '896 patent. As explained above, the '004 reference does not disclose the claimed exchange of needs and capabilities. CX-721C (Madisetti RWS) at 9.

The '004 reference does not disclose the steps (b), (c), (d), (e), and (g) of claim 12 of the '896 patent for the same reasons discussed above. *See* CX-721C (Madisetti RWS) at 10-13. Furthermore, under Microsoft's incorrect proposed construction of "physical proximity," the '004 reference does not disclose step (a) which under Microsoft's construction requires the detection of "a predetermined distance." RRX-68C (McNair) 39; McNair Tr. 1042-43; CX-721C (Madisetti RWS) at 10-11.

2. The SWAN Reference

The SWAN reference ("SWAN") was disclosed to the Patent Office during prosecution of the '896 patent and describes dynamic topology management of a mobile wireless communication network. *See* JX-6 ('896 Patent File History) at 4372; RX-210 356. SWAN appears to be focused on providing efficient communication channels and improved quality of service overall, as opposed to the services themselves.

SWAN does not disclose the second step of claim 1 of the '896 patent. Specifically, SWAN does not disclose either a step of "authorizing . . . to establish [a] setup connection" or any authorization "based on said identification of said first peer." CX-721C (Madisetti RWS) at 14-15. SWAN discloses only that "[a]ny node hearing an

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originator may, at its discretion, request to become a neighbor of an originator . . . ." RX-210 356. There is, however, no disclosure of any circumstance in which in which the receiving node would not be permitted to connect, or in which the originator ID would form the basis for any such permission. The SWAN disclosure thus does not establish that the node's "discretion" constitutes either an authorization to establish a setup connection or an authorization based on any particular piece of information. Indeed, SWAN is silent as to how the originator's ID is used and provides no disclosure, either explicitly or inherently, that an authorization step occurs based on that ID. Instead, it appears that the connection is based entirely on the availability of free slots, rather than based on any authorization. Consequently, there is no authorization to establish any connection, let alone a "setup connection," as required by the claims. CX-721C (Madisetti RWS) at 14-15.

SWAN does not disclose the third step of claim 1 of the '896 patent. Specifically, SWAN does not disclose the transmission either of "needs" or "capabilities," as those terms have been jointly construed by the parties. CX-721C (Madisetti RWS) at 15-16. Mr. McNair identifies communication of information relating to attributes of the communications link itself (*e.g.*, quality and bandwidth)—the very "characteristics of the connection between the peers" that the parties stipulated are irrelevant to "needs" and "capabilities."[44] But Mr. McNair does not point to any services that may be provided by

[44] Microsoft argues that Motorola has taken an inconsistent position regarding the relationship between "slots" and "capabilities" in (1) the accused Xbox system and (2) the SWAN reference. Microsoft's argument is incorrect. As Dr. Madisetti has explained, the request for slot allocation disclosed by the SWAN reference differs from the link control request message transmitted during the discovery process of Microsoft's Xbox system, which requests the use of a particular slot *for the purpose of obtaining a*

the nodes using the communications link. RX-313 (McNair WS) at 23-24 ("SWAN provides this functionality by negotiating connection parameters . . . ."); RX-210 356.

SWAN does not disclose the fourth step of claim 1 of the '896 patent. First, the SWAN reference does not disclose the exchange of needs and capabilities, as discussed above. Second, there is no disclosure in the SWAN reference of selectively using an addressed connection for the provision of one or more services (*i.e.*, selectively processing). CX-721C (Madisetti RWS) at 16.

The SWAN reference does not disclose steps (b)–(h) of claim 12 for the reasons discussed above. CX-721C (Madisetti RWS) at 17. Furthermore, even under Microsoft's incorrect proposed construction of "physical proximity," the '004 reference does not disclose step (a) which under Microsoft's construction requires the detection of "a predetermined distance." RRX-68C (McNair) 39; McNair Tr. 1042; CX-721C (Madisetti RWS) at 17.

3. U.S. Patent 6,094,575

U.S. Patent No. 6,094,575 ("the '575 patent") describes a wireless communications network architecture, involving one or more base stations (BS) and one or more mobile stations (MS). RX-208.

The '575 patent does not disclose the second step of claim 1 of the '896 patent. Specifically, there is no disclosure of an authorization scheme involving the identification of a first peer. CX-721C (Madisetti RWS) at 20-21. Mr. McNair argues that the MS evaluates the BS identified in the General Poll (BS ID) to determine whether it wished to

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***particular** functionality*. CX-721C (Madisetti RWS) at 15; Madisetti Tr. 2210-11; 2213-14.

acquire a link to the BS. RX-313 (McNair WS) at 27. However, there is no disclosure of such an evaluation in the '575 patent, much less any disclosure of any permission on the basis of BS ID, as would be required by both parties' proposed constructions of this claim step. Furthermore, as Dr. Madisetti testified, a person of ordinary skill would not understand that the MS must necessarily perform an authorization (or even any evaluation) based on the Base ID information that is received. For example, the MS could establish a setup connection solely on the basis of the information received in the Slot Quality portion of the General Poll message, as described in Column 68 (and Column 144) of the '575 patent. The MS could use the Base ID information for purposes other than authorizing the MS to establish a setup connection. For example, the Base ID information could be used to separately process packets from multiple base stations during a hand-off routine (*e.g.*, a neighbor list). CX-721C (Madisetti RWS) at 20-21.

The '575 patent does not disclose the third step of claim 1 of the '896 patent. There is no disclosure in the '575 patent that either the BS or the MS transmits any "needs" information. Further, the MS Capabilities and BS Capabilities disclosed by the '575 patent identify only attributes of the communications link (*e.g.*, ciphering or the ability to receive FAX data), not services that may be provided by the MS or the BS, such as printing a fax or annunciating data over a speaker.[45] *See* RX-208 at col. 131, lns. 44-55; Madisetti Tr. 2214-19. Additionally, the '575 patent does not disclose an initial setup connection that is formed between an MS and a BS to permit further negotiation of a

[45] In the 'Background of the Invention' section, the '896 patent describes the ability to receive a fax—a specified '575 patent capability—as not the type of capability the '896 discloses. *See* JX-5 at col. 1, lns. 8-43 ("For example, a portable telephone could receive a facsimile (fax), but typically has no capability to print the fax and typically has no capability to communicate with a printer which may be able to print the fax.").

service connection. CX-721C (Madisetti RWS) at 21-22.

The '575 patent does not disclose the fourth step of claim 1 of the '896 patent. First, as explained above, the '575 patent does not disclose the exchange of needs and capabilities. Second, the '575 patent does not include any disclosure of selectively using an addressed service connection for the provision of one or more services (*i.e.*, selectively processing). Instead, the '575 patent simply discloses that a BS and an MS can communicate. CX-721C (Madisetti RWS) at 22.

The '575 patent does not disclose steps (b), (c), (f), (g) and (h) of claim 12, for the reasons discussed above. CX-721C (Madisetti RWS) at 23-25. Under Microsoft's incorrect proposed construction of "physical proximity," the '004 reference does not disclose step (a) which under Microsoft's construction requires the detection of "a predetermined distance." RRX-68C (McNair) 39; McNair Tr. 1042-43; CX-721C (Madisetti RWS) at 23.

4. WaveLAN Paper

The WaveLAN reference ("WaveLAN") describes at a high level the characteristics of a model for a wireless local area network (W-LAN).

WaveLAN does not disclose the first step of claim 1 of the '896 patent. Specifically, WaveLAN does not disclose the initiation of an initial connection to permit further negotiations of a service connection (*i.e.*, a setup connection). CX-721C (Madisetti RWS) at 26.

WaveLAN does not disclose the second step of claim 1 of the '896 patent. Mr. McNair argues that only the frames from a mobile station using the correct NWID are forwarded to the MAC (Media Access Control) layer of the protocol so the authorization

of the second peer to establish a connection with the first peer is based on the first peer identification. RX-313 (McNair WS) at 31-32. This opinion, however, does not relate to the establishment of a setup connection or the authorization of a peer to establish a service connection. Rather, this relates to so-called "filtering" of NWID within the mobile station's network stack, potentially to minimize its processing requirements once a connection has been established. As Dr. Madisetti testified, a person of ordinary skill would not understand that the MS must necessarily perform an authorization (or even any evaluation) based on the NWID information received. Specifically, the MS could establish a setup connection solely on the basis of the network's communications quality, as described on page 1446 of the WaveLAN reference: "The Sign-on protocol is used by an MS when it is initially activated, after it has discovered an AP with an acceptable RF communications quality (based on beacon analysis)." CX-721C (Madisetti RWS) at 26-27.

WaveLAN does not disclose the third step of claim 1 of the '896 patent. WaveLAN's disclosure of routing tables, OSPF protocol, and the concepts of the so-called SNAP model are not "needs" and "capabilities," as the parties have jointly construed those terms. As Dr. Madisetti explains, routing tables are used to make the network run correctly; they are not related to the provision of services at either peer. Similarly, the OSPF protocol and SNAP model, to the extent they are disclosed in WaveLAN, do not relate to the input or output capabilities or other services that the peers may offer.[46] Also, any implied negotiation of these network-related routing resources, as

[46] Mr. McNair's reliance on the SNAP model is also improper. Mr. McNair did not cite to any specific SNAP document; Microsoft did not produce any documents regarding

disclosed in WaveLAN, does not indicate that needs or capabilities (as claimed in the '896 patent) are ever exchanged. WaveLAN also does not disclose an initial setup connection that is formed between a mobile station and an access point to permit further negotiation of a service connection. CX-721C (Madisetti RWS) at 27-28.

WaveLAN does not disclose the fourth step of claim 1 of the '896 patent. First, WaveLAN does not disclose the exchange of needs and capabilities, as explained earlier. Second, WaveLAN does not identify any disclosure of choosing to use a service connection to provide particular services (selectively processing). Instead, WaveLAN discloses merely that an access point and a mobile station can communicate. CX-721C (Madisetti RWS) at 28-29.

Assuming it is limiting, WaveLAN does not disclose the preamble of claim 12 for the reasons discussed above. CX-721C (Madisetti RWS) at 29. Additionally, WaveLAN does not disclose steps (b), (c), (d), (f), (g), and (h) of claim 12 for the reasons discussed above. CX-721C (Madisetti RWS) at 29-31. WaveLAN also does not disclose step (e) of claim 12 of the '896 patent. Mr. McNair relies on the handover process to satisfy this step. But WaveLAN does not disclose the forming of a service connection during the handover process based on authorization or the use of an identification code. To the contrary, WaveLAN discloses handover occurring based solely on the quality of signal received from nearby access points. RX-212 at 1446. CX-721C (Madisetti RWS) at 30-31. Furthermore, should the Commission adopt Microsoft's incorrect proposed

SNAP. Nor does WaveLAN incorporate by reference the SNAP specification. *See Commonwealth Scientific & Indus. Research Org. v. Buffalo Tech.*, 542 F.3d 1363, 1372 (Fed. Cir. 2008) ("To incorporate material by reference, the host document must identify with detailed particularity what specific material it incorporates and clearly indicate where that material is found in the various documents").

construction of "physical proximity," the '004 reference does not disclose step (a) which under Microsoft's construction requires the detection of "a predetermined distance." RRX-68C (McNair) 39; McNair Tr. 1042-43; CX-721C (Madisetti RWS) at 29.

5. U.S. Patent 5,546,448 in Combination with ITU V.34

U.S. Patent No. 5,546,448 ("the '448 patent") discloses a modem interface for use in a wired communication system. The V.34 reference discloses technical aspects of a 28.8 kbps modem, designed to operate in a wired environment.

The combination of these two reference does not disclose or render obvious the third step of claim 1 of the '896 patent. Neither the '448 patent nor the V.34 reference discloses any communication of "needs" or "capabilities," as the parties have jointly construed those claim terms. Mr. McNair relies on "data rates" and "power levels," but, as the parties have stipulated, these are not the "needs" and "capabilities" of the '896 patent. RX-313 (McNair WS) at 39; CX-721C (Madisetti RWS) at 32-33. Modem handshake procedures were well-known to the inventors of the '896 patent and are distinguished from the types of needs and capabilities exchanges the patent sought to cover. CX-721C (Madisetti RWS) at 32-33.

The combination of these two references does not disclose the fourth step of claim 1 of the '896 patent. First, as explained earlier, neither reference discloses the required exchange of needs and capabilities. Second, neither reference includes a disclosure of selectively using an addressed service connection for the provision of one or more services (*i.e.*, selectively processing). CX-721C (Madisetti RWS) at 33. Indeed, Mr. McNair relies only on communications within the network at common operating speeds and similar communication level parameter matching. RX-313 (McNair WS) at 39-40.

6. Secondary Considerations

There was, at the time Borgstahl, et al., invented the claimed methods of the '896 patent, a long-felt need for a wireless, peer-to-peer, capability addressable network. *See* CX-721C (Madisetti RWS) at 33-34; CX-713C. At the time of the invention of the '896 patent, short-range wireless technologies had no way of connecting the right peers without knowing their unique network address. *See* CX-721C (Madisetti RWS) at 33-34; CX-713C. The need for the invention of the '896 patent was clear, and long-felt.

Products incorporating the patented invention, such as the Droid X and Droid 2 smartphones, as well as related products such as the CommandOne Bluetooth Headset, have enjoyed commercial success, as do the products sold by infringers of the '896 patent, including Respondent. CX-721C (Madisetti RWS) at 33-34. Motorola's revenues derived from sales of the Droid 2 and Droid X totaled over [ ]. *See* CX-565C. The Droid 2 and Droid X's ability to establish service connections based on exchange of needs and capabilities was a substantial and motivating factor in its commercial success, notwithstanding the existence of additional features. *See* CX-721C (Madisetti RWS) at 33-34. Motorola also has licensed the '896 patent to others.

Microsoft's expert, Mr. McNair performed no analysis and provided no opinion on secondary considerations of non-obviousness. McNair Tr. 1102.

7. Written Description

Mr. McNair argues that the terms "authorizing said second peer to establish said setup connection with said first peer based on said identification of said first peer" and "forming a wireless service connection between said service requesting and service-providing peers when said service-requesting peer is authorized through an identification

code" lack written description support, because there is allegedly insufficient disclosure of "authorization based on the identification of the first peer." Mr. McNair is incorrect.

It is well established that the originally-filed claims provide written description support. *See Union Oil Co. of California v. Atlantic Richfield Co.*, 208 F.3d 989, 998 (Fed. Cir. 2000). Authorization processes based on the identification of the first peer were disclosed by the claims that accompanied the originally-filed application for the '896 patent. For example, application claims 20 and 21 included the following steps:

> d) communicating authorization information ***describing said service-requesting peer to said service-providing peer***;
>
> e) determining ***whether to form a wireless service connection*** between said service-requesting and service-providing peers ***in response to said authorization information.***

JX-6 ('896 Patent File History) at 4340-41. The broad term "authorization information" certainly encompasses, and provides adequate support for, an identification number used for authorization.

Additionally, the '896 patent discloses:

> Task 62 initiates a setup connection by broadcasting a need/capability message 64, an exemplary format for which is depicted in FIG. 7. Referring to FIG. 7, message 64 includes an ID 66 for the peer 20 broadcasting message 64, an authorization key 68, a need specification 70, a capability specification 72, and can include other data elements. . . . Authorization key 68 includes one or more data codes which may be used by a receiving peer 20 in performing an authorization process.

JX-5 at col. 6, lns 41-52.

> When task 58 eventually detects that a setup connection is being attempted by receiving a message 64, a task 78 performs an authorization process. Task 78 uses

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> authorization key 68 (see FIG. 7) from message 64 to determine if the peer 20 attempting to setup a connection is authorized to connect to the receiving peer 20. Task 78 allows an owner of a peer 20 to restrict access to the owned peer 20 through network 22. The authorization process of task 78 may be used, for example, to restrict personalization capabilities of an appliance to a small family group.

Id. at col. 7, lns. 39-59.

As Dr. Madisetti explained, a person of ordinary skill in the art would understand from these teachings that the inventors were in possession of, and had disclosed, an authorization routine. CX-721C (Madisetti RWS) at 34-36. In the preferred embodiments, the authorization routine may be based on an authorization key and, as Dr. Madisetti explained, a device's ID (or some other piece of information describing a device) can serve as an authorization key. Indeed, as taught by application claim 20, the communicated authorization information could "describ[e] said service requesting peer."

Mr. McNair also argues that Claim 12 is indefinite because one having ordinary skill in the art is not able to determine whether the two "forming" steps of the claim are in the alternative to each other, or in addition to each other. However, the claim language itself answers this question: by separately identifying both steps and connecting them with the word "and," the claim makes clear that the conditions identified in both steps, not just one or the other, must be satisfied. The '896 patent prosecution history points to the same conclusion. The two "forming" steps were incorporated into application claim 20 (which became claim 12) during prosecution. In explaining those steps to the Examiner, the applicants made clear that the requirements set forth in those steps were "in addition" to each other, not in the alternative:

> Applicants' claim 20 recites, among other things, a method of operating a capability addressable peer-to-peer data communication network. Authorization information is communicated that describes the service-requesting peer to the service-providing peer. A wireless service connection is formed between the service-requesting and service-providing peers when the service-requesting peer is authorized. In addition, the wireless service connection is formed between the service-requesting and service-providing peers when the service-providing peer is determined to have a capability compatible with the need.

JX-6 ('896 Patent File History) at 4640.

In view of the language of the claim itself, as further informed by the applicants' discussion during prosecution, a person of ordinary skill in the art would understand that both "forming" steps must occur as part of the claimed method—*i.e.*, that both "when" conditions must be met—and that the "providing" step must use the resulting service connection. CX-721C (Madisetti RWS) at 36-38. Indeed, Microsoft did not assert that either "forming" step was indefinite in the parties' joint identification of terms and proposed constructions. For these reasons, Microsoft has filed to meet its high burden of proving that Claim 12 is insolubly ambiguous. *See, e.g.*, *IGT*, 659 F.3d at 1119 ("A claim is only indefinite if it is not amenable to construction or is insolubly ambiguous."); *Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1366 (Fed. Cir. 2011) ("Because claim construction frequently poses difficult questions over which reasonable minds may disagree, proof of indefiniteness must meet '*an exacting standard.*'") (emphasis added).

D. Domestic Industry (Technical Prong)

Motorola's Domestic Industry Bluetooth products are Droid 2 and Droid X smartphones (among other Bluetooth-enabled products). CX-712C (Madisetti WS) at 3-4, 112. Each of these products is compliant with version 2.1 of the Bluetooth

Specification, CX-44; CX-47; McNair Tr. 1104-1105, which implements the invention of the '896 patent. CX-713C (Leeper WS) at 5-6; Leeper Tr. 138-39.

For the reasons set forth below, Motorola has satisfied the technical prong of the domestic industry requirement with respect to the '896 patent.

Claim 12

The preamble of independent method claim 12 recites:

> **A method of operating a capability addressable peer-to-peer data communication network comprising the steps of:**

Motorola has satisfied the preamble.

The claim term "peer-to-peer" has been construed to mean "having at least common portions of communications protocol and/or capability and does not refer to equivalence of physical size, functional capability, data processing capacity or transmitter/receiver range or power." Additionally, the claim term "capability addressable peer-to-peer data communication network" has been construed to mean "a peer-to-peer data communications network where messages may be addressed in some manner related to capability."

The preamble is practiced by Motorola's Domestic Industry Bluetooth products. Motorola's Droid 2 and Droid X products, as well as related products such as Motorola's CommandOne Bluetooth Headset, can operate in a peer-to-peer data communication network, sharing portions of the common protocol established in the Bluetooth Specification.[47] CX-712C (Madisetti WS) at 112.

[47] Microsoft has asserted that a Bluetooth network is not a "peer-to-peer" network, and that the Motorola devices are not "peers," because the Bluetooth Specification often uses

Step a) of claim 12 recites:

> **a) detecting, at a first one of a service-requesting peer and a service-providing peer, physical proximity of a second one of said service-requesting and service-providing peers;**

Motorola has satisfied this claim step.

The claim term "peer" has been construed to mean "a computer or microprocessor controlled electronic device in a peer-to-peer network." Additionally, the term "physical proximity" has been construed to mean "within range of a peer in a low power wireless network."

The Motorola Domestic Industry Bluetooth products perform this step. CX-712C (Madisetti WS) at 114. A Motorola Bluetooth-compliant product, such as the Droid 2, will engage in an inquiry routine to discover whether other Bluetooth devices are within range of the inquiring device. *Id.* at 100-102. During the inquiry routine, an unaddressed message is broadcast (here, by the exemplary Droid 2) 1600 times per second on frequency-hopped channels. *Id.* at 100-101, 114; CX-520 (BT Spec.) vol. 2, pp. 155, 160. In the Motorola Android source code of the Droid 2, the inquiry routine is initiated any time the function doDiscovery() is invoked. CX-712C (Madisetti WS) at 102. Any discoverable device, such as a Droid X, will detect the broadcasted inquiry message. CX-712C (Madisetti WS) at 100; CX-520 (BT Spec.) vol. 2, pp. 155, 160.

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the terms "master" and "slave" when referring to Bluetooth communications. But the '896 patent's explicit definition of "peer-to-peer" does not preclude the peers from being in a master/slave arrangement. CX-712C (Madisetti WS) at 112-13. Moreover, Bluetooth networks are consistently referred to in industry publications and textbooks as peer-to-peer networks. Indeed, the official Bluetooth Specification itself repeatedly refers to Bluetooth communications as "peer-to-peer." CX-520 (BT Spec.) vol. 2, p. 855; CX-712C (Madisetti WS) at 112-13; Madisetti Tr. 260; 267.

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Motorola has proposed that the term "physical proximity" means "within range of a peer in a low power wireless network." The Motorola Bluetooth products operate in a short-range low-power communications system with a range of 10 meters (about 33 feet). Carrying forward the concept of the '896 patent, the Bluetooth Specification explains that the service discovery protocol is intended to address the unique characteristics of the environment, "where the set of services that are available changes dynamically based on *the RF proximity of devices* in motion." CX-520 (BT Spec.) vol. 3, p. 133 (emphasis added); CX-712C (Madisetti WS) at 102, 114-15. Also, because Bluetooth devices are designed to connect with one another within a distance of 10 meters, this limitation is met even under Microsoft's construction. CX-712C (Madisetti WS) at 102, 115-16; CX-48.

Step b) of claim 12 recites:

> **b) determining whether a need for a service connection exists at one of said service-requesting and service-providing peers;**

Motorola has satisfied this claim step.

The claim term "peer" has been construed to mean "a computer or microprocessor controlled electronic device in a peer-to-peer network."

The Motorola Domestic Industry Bluetooth products perform this step. CX-712C (Madisetti WS) at 116. This step is performed whenever an application running on the service-requesting peer, for example the Droid 2, determines that it needs a particular service, such as a secondary input or display for a Bluetooth-enabled game. *Id.* Once a service-requesting device has determined that it has a need for a particular service (identified by a "Universally Unique Identifier" (UUID)), it will initiate a discovery process to search for a device that can provide a matching capability. *Id.* at 102, 116. Dr.

Madisetti explained how the source code he reviewed established that a determination is made. *Id.*

Step c) of claim 12 recites:

> **c) establishing, if said determining step identifies said need, a setup wireless connection between said service-requesting and service-providing peers;**

Motorola has satisfied this claim step.

The claim term "peer" has been construed to mean "a computer or microprocessor controlled electronic device in a peer-to-peer network." Additionally, the term "setup wireless connection" has been construed to mean "an initial wireless connection over which two peers can negotiate an addressed service connection."

The Motorola Domestic Industry Bluetooth products perform this step of claim 12. CX-712C (Madisetti WS) at 117. Once an application running on the service-requesting device (here the Droid 2) determines that a need exists for a particular service, then the device will transmit a "page" message defined by the Bluetooth Specification to the service-providing device (here the Droid X). *Id.* at 103-104, 117; CX-520 (BT Spec.) vol. 2, p. 71 & Tbl. 8.3. The two devices will then exchange several additional messages, involving necessary information for synchronization and frequency hopping, to form the setup wireless connection. CX-712C (Madisetti WS) at 103-104, 117-18; CX-520 (BT Spec.) vol. 2, p. 151 & Tbl. 8.3.

Step d) of claim 12 recites:

> **d) communicating authorization information describing said service-requesting peer to said service-providing peer;**

Motorola has satisfied this claim step.

The claim term "authorization information" has been construed to mean "information used for authorization."

The Motorola Domestic Industry Bluetooth products perform this step. CX-712C (Madisetti WS) at 118. The Bluetooth authentication procedure is based on a challenge-response scheme. *Id.* at 104-105, 118. When the service-providing peer (once again, here the Droid X) sends a challenge to the service-requesting peer, (once again, here the Droid 2), the service-requesting peer will respond to the challenge by communicating a response that contains authorization information describing a combination of the challenge, the service-requesting peer's BD_ADDR and a secret key. *Id.* at 104-105, 118-19; CX-520 (BT Spec.) vol. 2, p. 240.

Motorola has proposed that the term "authorization information" means "information used for authorization." Under this construction, the "key," which describes a combination of the challenge, the service-requesting peer's BD_ADDR and a secret key, is transmitted in the response to the security challenge and is used for authorization. CX-712C (Madisetti WS) at 104-105, 119. Microsoft's proposed construction for the term is "one or more code numbers or passwords that provide permission to use a resource." Under Microsoft's construction, the "key" is a "code number" which satisfies this construction. *Id.*

Step e) of claim 12 recites:

> **e) forming a wireless service connection between said service-requesting and service-providing peers when said service-requesting peer is authorized through an identification code;**

Motorola has satisfied this claim step.

The claim term "wireless service connection" has been construed to mean "a wireless connection over which services can be provided to peers." Additionally, the claim term "authorized through an identification code" has been construed to mean "permitted using an identification code."

The Motorola Domestic Industry Bluetooth products perform this step. CX-712C (Madisetti WS) at 119. Upon receipt of the service-requesting peer's response, the service-providing peer determines whether the response is correct. *Id.* at 104-105, 120; CX-520 (BT Spec.) vol. 2, p. 240. As explained in the server-side Java source code function listenUsingRfcommWithServiceRecord() for the Motorola Bluetooth products, the "remote device connecting to [a socket for a particular UUID] will be authenticated." CX-712C (Madisetti WS) at 120-21.

In order to determine whether the response is correct, as described above, the two devices both need to have knowledge of an identification code—the shared secret key. CX-712C (Madisetti WS) at 104-05, 121. If the response is incorrect, then no service connection will be permitted. *Id.* at 105, 121. If the response is correct, then the devices are authorized to form a service connection, provided the remaining negotiations are successful. *Id.* at 106, 121.

Motorola has proposed that the term "authorized through an identification code" means "permitted using an identification code." Under this construction, the shared secret key, in combination with other shared information, permits the service-requesting device to form a connection. CX-712C (Madisetti WS) at 121. Microsoft's proposed construction of the term is "determining, using the identification code, whether the

service-requesting peer has permission to establish a wireless service connection with the service-providing peer." One of the authentication mechanisms used by the Bluetooth Specification is the utilization of a shared secret key. Based on this secret key, the service-providing peer determines whether the service-requesting peer is authorized, and thus the limitation is met, even under Microsoft's proposed construction. *Id.* at 104-105, 122.

Step f) of claim 12 recites:

> **communicating capability information describing said service-providing peer to said service-requesting peer;**

Motorola has satisfied this claim step.

The Motorola Domestic Industry Bluetooth products perform this step. CX-712C (Madisetti WS) at 122. In response to an SDP Request message during the service discovery process, the service-providing peer will communicate an SDP Response message, which includes a list of service records, if any, that match the service request pattern. *Id.* at 106-08, 122; CX-520 (BT Spec.) vol. 3, p. 132-33. The parties have jointly proposed that the term "capabilities" should be understood to mean "functionality that a peer can perform for another peer over a service connection; capabilities do not relate to characteristics of the connection between the peers." The claim limitation is met under this construction because the "service record handles" transmitted by the service-providing peer in an SDP Response message relate to services that the service-providing peer can perform over a service connection. CX-712C (Madisetti WS) at 108, 122-23; CX-520 (BT Spec.) vol. 3, pp. 118, 122, 133-34, 138.

Step g) of claim 12 recites:

> **g) forming said wireless service connection between said service-requesting and service-providing peers when said service-providing peer is determined to have a capability compatible with said need determined in step b); and**

Motorola has satisfied this claim step.

The claim term "wireless service connection" has been construed to mean "a wireless connection over which services can be provided to peers."

The Motorola Domestic Industry Bluetooth products perform this step. CX-712C (Madisetti WS) at 123. If the service-responding peer's SDP Response message identifies a Universally Unique Identifier (UUID) that matches the UUID needed by the service-requesting peer, then a service connection will be formed between the devices. *Id.* at 109, 123-24. When the capabilities are not matched, an exception occurs and the connection is not formed. CX-712C (Madisetti WS) at 108-109, 124; CX-520 (BT Spec.) vol. 3, p. 134.

Step h) of claim 12 recites:

> **h) providing said capability using said service connection.**

Motorola has satisfied this claim step.

The Motorola domestic industry products perform this step. CX-712C (Madisetti WS) at 124-25. If the service discovery process completes successfully, then the service-providing peer, here the Droid X, will provide the requested capability over the service connection. *Id.* at 111, 125.

VI. U.S. Patent No. 7,162,094

U.S. Patent No. 7,162,094 ("the '094 patent") is titled, "Frequency Coefficient Scanning Paths for Coding Digital Video Content." JX-9 ('094 patent). The '094 patent issued on January 9, 2007, and the named inventors are Limin Wang, David Baylon, Krit Panusopone, Rajeev Gandhi, Yue Yu, and Ajay Luthra. *Id.* The '094 patent relates to "digital video encoding, decoding, and bitstream generation," and more specifically, relates to "scanning paths in transform-based coding as used in MPEG-4 Part 10 Advanced Video Coding/H.264, for example." *Id.* at col. 1, lns. 17-21 (Technical Field).

Motorola asserts independent apparatus claims 7, 8, and 10. The asserted claims read as follows:

> 7. A device for decoding digital video content wherein the digital video content is represented in a one dimensional array of frequency coefficients, the device comprising:
>
> > a scanner that scans the one dimensional array of frequency coefficients in a scanning order p starting at 0 and ending at 15, consecutively, to produce a representation of the digital video content in a two dimensional array of frequency coefficients, the two dimensional array of frequency coefficients is represented in columns and rows wherein the columns are represented by a variable n=0, 1, 2, or 3, and the rows are represented by a variable m=0, 1, 2, or 3, further comprising;
> >
> > > assigning the two dimensional frequency coefficient located at n=0 and m=0 a value of the one dimensional frequency coefficient located at p=0;
> > >
> > > assigning the two dimensional frequency coefficient located at n=0 and m=1 a value of the one dimensional frequency coefficient located at p=1;
> > >
> > > assigning the two dimensional frequency coefficient located at n=1 and m=0 a value of the one dimensional frequency coefficient located at p=2;

assigning the two dimensional frequency coefficient located at n=0 and m=2 a value of the one dimensional frequency coefficient located at p=3;

assigning the two dimensional frequency coefficient located at n=0 and m=3 a value of the one dimensional frequency coefficient located at p=4;

assigning the two dimensional frequency coefficient located at n=1 and m=1 a value of the one dimensional frequency coefficient located at p=5;

assigning the two dimensional frequency coefficient located at n=1 and m=2 a value of the one dimensional frequency coefficient located at p=6;

assigning the two dimensional frequency coefficient located at n=1 and m=3 a value of the one dimensional frequency coefficient located at p=7;

assigning the two dimensional frequency coefficient located at n=2 and m=0 a value of the one dimensional frequency coefficient located at p=8;

assigning the two dimensional frequency coefficient located at n=2 and m=1 a value of the one dimensional frequency coefficient located at p=9;

assigning the two dimensional frequency coefficient located at n=2 and m=2 a value of the one dimensional frequency coefficient located at p=10;

assigning the two dimensional frequency coefficient located at n=2 and m=3 a value of the one dimensional frequency coefficient located at p=11;

assigning the two dimensional frequency coefficient located at n=3 and m=0 a value of the one dimensional frequency coefficient located at p=12;

assigning the two dimensional frequency coefficient located at n=3 and m=1 a value of the one dimensional frequency coefficient located at p=13;

assigning the two dimensional frequency coefficient located at n=3 and m=2 a value of the one dimensional frequency coefficient located at p=14; and

assigning the two dimensional frequency coefficient located at n=3 and m=3 a value of the one dimensional frequency coefficient located at p=15.

8. A device for decoding digital video content wherein the digital video content is represented in a one dimensional array of frequency coefficients, wherein the one dimensional array of frequency coefficients is represented by a variable p=0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, or 15, the device comprising:

a generator that produces a representation of the digital video content in a two dimensional array of frequency coefficients, the two dimensional array of frequency coefficients is represented in columns and rows wherein the columns are represented by a variable n=0, 1, 2, or 3, and the rows are represented by a variable m=0, 1, 2, or 3, further comprising;

assigning the two dimensional frequency coefficient located at n=0 and m=0 a value of the one dimensional frequency coefficient located at p=0;

assigning the two dimensional frequency coefficient located at n=0 and m=1 a value of the one dimensional frequency coefficient located at p=1;

assigning the two dimensional frequency coefficient located at n=1 and m=0 a value of the one dimensional frequency coefficient located at p=2;

assigning the two dimensional frequency coefficient located at n=0 and m=2 a value of the one dimensional frequency coefficient located at p=3;

assigning the two dimensional frequency coefficient located at n=0 and m=3 a value of the one dimensional frequency coefficient located at p=4;

assigning the two dimensional frequency coefficient located at n=1 and m=1 a value of the one dimensional frequency coefficient located at p=5;

assigning the two dimensional frequency coefficient located at n=1 and m=2 a value of the one dimensional frequency coefficient located at p=6;

assigning the two dimensional frequency coefficient located at n=1 and m=3 a value of the one dimensional frequency coefficient located at p=7;

assigning the two dimensional frequency coefficient located at n=2 and m=0 a value of the one dimensional frequency coefficient located at p=8;

assigning the two dimensional frequency coefficient located at n=2 and m=1 a value of the one dimensional frequency coefficient located at p=9;

assigning the two dimensional frequency coefficient located at n=2 and m=2 a value of the one dimensional frequency coefficient located at p=10;

assigning the two dimensional frequency coefficient located at n=2 and m=3 a value of the one dimensional frequency coefficient located at p=11;

assigning the two dimensional frequency coefficient located at n=3 and m=0 a value of the one dimensional frequency coefficient located at p=12;

assigning the two dimensional frequency coefficient located at n=3 and m=1 a value of the one dimensional frequency coefficient located at p=13;

assigning the two dimensional frequency coefficient located at n=3 and m=2 a value of the one dimensional frequency coefficient located at p=14; and

assigning the two dimensional frequency coefficient located at n=3 and m=3 a value of the one dimensional frequency coefficient located at p=15.

10. A computer readable medium encoded with a computer program used to control a video processor that receives a first signal wherein the first signal is represented in a one dimensional array of frequency coefficients wherein the one dimensional array of frequency coefficients is represented by a variable p=0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, or 15, the computer readable medium controlling the video processor in a method comprising:

generating a two dimensional array of frequency coefficients from the one dimensional array of frequency coefficients, wherein the two dimensional array of frequency coefficients is represented in columns and rows wherein the columns are represented by a variable n=0, 1, 2, or 3, and the rows are represented by a variable m=0, 1, 2, or 3, further comprising;

assigning the two dimensional frequency coefficient located at n=0 and m=0 a value of the one dimensional frequency coefficient located at p=0;

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assigning the two dimensional frequency coefficient located at n=0 and m=1 a value of the one dimensional frequency coefficient located at p=1;

assigning the two dimensional frequency coefficient located at n=1 and m=0 a value of the one dimensional frequency coefficient located at p=2;

assigning the two dimensional frequency coefficient located at n=0 and m=2 a value of the one dimensional frequency coefficient located at p=3;

assigning the two dimensional frequency coefficient located at n=0 and m=3 a value of the one dimensional frequency coefficient located at p=4;

assigning the two dimensional frequency coefficient located at n=1 and m=1 a value of the one dimensional frequency coefficient located at p=5;

assigning the two dimensional frequency coefficient located at n=1 and m=2 a value of the one dimensional frequency coefficient located at p=6;

assigning the two dimensional frequency coefficient located at n=1 and m=3 a value of the one dimensional frequency coefficient located at p=7;

assigning the two dimensional frequency coefficient located at n=2 and m=0 a value of the one dimensional frequency coefficient located at p=8;

assigning the two dimensional frequency coefficient located at n=2 and m=1 a value of the one dimensional frequency coefficient located at p=9;

assigning the two dimensional frequency coefficient located at n=2 and m=2 a value of the one dimensional frequency coefficient located at p=10;

assigning the two dimensional frequency coefficient located at n=2 and m=3 a value of the one dimensional frequency coefficient located at p=11;

assigning the two dimensional frequency coefficient located at n=3 and m=0 a value of the one dimensional frequency coefficient located at p=12;

assigning the two dimensional frequency coefficient located at n=3 and m=1 a value of the one dimensional frequency coefficient located at p=13;

> assigning the two dimensional frequency coefficient located at n=3 and m=2 a value of the one dimensional frequency coefficient located at p=14; and
>
> assigning the two dimensional frequency coefficient located at n=3 and m=3 a value of the one dimensional frequency coefficient located at p=15.

JX-9 at col. 17, ln. 44 – col. 19, ln. 31; col. 20, ln. 31 – col. 22, ln. 13.

A. Claim Construction[48]

1. "one dimensional array" (claims 7, 8, 10); "one dimensional array of frequency coefficients" (claims 7, 8, 10)

Claim Term	Motorola's Proposed Construction	Microsoft's Proposed Construction
"one dimensional array" (claims 7, 8, 10)	a set of items arranged in a single column or row	a linear, numbered collection of variables all of the same type where each variable, or cell, in the array has an index, and the cells in an array are numbered consecutively and indexed starting with 0 and going to N-1 where N is the length of the array
"one dimensional array of frequency coefficients" (claims 7, 8, 10)	a set of frequency coefficients arranged in a single column or row	a linear, numbered collection of frequency coefficients where each cell in the array has an index, and the cells in an array are numbered consecutively and indexed starting with 0 and going to N-1 where N is the length of the array

The claim term "one dimensional array" appears in the preamble and the first element of claim 7; the preamble of claim 8; and the preamble and the first element of claim 10. JX-9 at col. 17, ln. 44 – col. 19, ln. 31; col. 20, ln. 31 – col. 22, ln. 13.[49]

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[48] A person of ordinary skill in the art of the '094 patent in 2002 would have had at least a bachelor's degree in electrical or computer engineering or the equivalent, and at least three years of work experience in the field of video processing, or at least a master's degree in electrical or computer engineering or the equivalent, and at least one year of work experience in the field of video processing. CX-706C (Drabik WS) at 7.

[49] The claim term also appears in non-asserted claims. JX-9.

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Motorola construes the term to mean "a set of items arranged in a single column or row." Compls. Br. at 68; RX-394 (Joint Identification of Claim Terms and Proposed Constructions) at 4. Microsoft construes the term to mean "a linear, numbered collection of variables all of the same type where each variable, or cell, in the array has an index, and the cells in an array are numbered consecutively and indexed starting with 0 and going to N-1 where N is the length of the array." RX-394 at 4.

As proposed by Motorola, the claim term "one dimensional array" is construed to mean "a set of items arranged in a single column or row."

The claim term "one dimensional array of frequency coefficients" appears in the preamble and the first element of claim 7; the preamble of claim 8; and the preamble and the first element of claim 10. JX-9 at col. 17, ln. 44 – col. 19, ln. 31; col. 20, ln. 31 – col. 22, ln. 13.[50]

Motorola construes the term to mean "a set of frequency coefficients arranged in a single column or row." Compls. Br. at 68. Microsoft construes the term to mean "a linear, numbered collection of frequency coefficients where each cell in the array has an index, and the cells in an array are numbered consecutively and indexed starting with 0 and going to N-1 where N is the length of the array." Resp. Br. at 195; RX-394 at 4.

As proposed by Motorola, the claim term "one dimensional array of frequency coefficients" is construed to mean "a set of frequency coefficients arranged in a single column or row."

The parties dispute whether the term "one dimensional array" (also "1-D array") should be limited to a particular form of data structure used in computer programming, as

[50] The claim term also appears in non-asserted claims. JX-9.

proposed by Microsoft.

The Background section of the '094 patent states:

> Transform domain coding is used to remove spatial redundancy within each picture or temporally predicted residual picture. A residual picture is the difference between a picture and a picture that is temporally predicted from that picture. Each picture or temporally predicted residual picture comprises a number of blocks of pixels. <u>Each block refers to an N by M group of pixels where N refers to the number of columns of pixels in the block and M refers to the number of rows of pixels in the block.</u> Each block in the picture or temporally predicted residual picture is represented by an N by M array of luminance and chrominance coefficients which correspond to each pixel in the blocks' N by M grid of pixels. Each luminance coefficient represents the brightness level, or luminance, of its corresponding pixel. Each block in the picture or temporally predicted residual picture is also represented by an N by M array of chrominance coefficients which correspond to each pixel in the blocks' N by M grid of pixels. Each chrominance coefficient represents the color content, or chrominance, of its corresponding pixel. The term "picture" will be used hereafter and in the appended claims, unless otherwise specifically denoted, to mean either a picture or a temporally predicted residual picture.
>
> * * *
>
> Transform domain coding takes advantage of the fact that most of the energy of a signal containing the digital video content lies at low frequencies. Transform domain coding transforms the luminance coefficients in each <u>N by M array</u> from the spatial domain to the frequency domain. The transformed N by M array comprises coefficients which represent energy levels in the frequency domain. As used hereafter and in the appended claims, unless otherwise denoted, the coefficients of the transformed N by M array will be referred to as "frequency coefficients." Once the luminance coefficients have been transformed into frequency coefficients, various compression techniques can then be performed on the contents of picture in the frequency domain that would otherwise be impossible to

> perform in the spatial domain.
>
> The N by M array of frequency coefficients is two dimensional and must be converted into a one dimensional array of frequency coefficients so that the encoder or decoder can use the frequency coefficients to encode or decode the picture. The encoder generates the one dimensional array of frequency coefficients by scanning the two dimensional array of frequency coefficients using a particular scanning path. The scanning path refers to the order in which the frequency coefficients in the two dimensional array are scanned and output by the encoder into the one dimensional array.
>
> *****
>
> It is preferable for the encoder to first scan the high-energy low frequency coefficients and then scan the low-energy high frequency coefficients. Scanning the low frequency coefficients before the high frequency coefficients places the low frequency coefficients before the high frequency coefficients in the resulting one dimensional array of coefficients. This particular order allows efficient coding and compression of the picture.

JX-9 at col. 2, ln. 51 – col. 4, ln. 10 (emphases added).

The specification portion cited above explains that in "an N by M group of pixels," N refers to "the number of columns" of pixels, and M refers to "the number of rows" of pixels. Thus, as disclosed in the Background section of the '094 patent, a person of ordinary skill in the art would understand that the claim term "one dimensional array" is simply referring to one dimensional ordering of items (*i.e.*, a set of items arranged in a single column or row).

The term "one dimensional array" is understood similarly in the H.264 Standard, which incorporates the scan pattern claimed in the '094 patent, and generally in the field of mathematics. Drabik Tr. 450. Specifically, the H.264 Standard states: "A one

dimensional array is referred to as a list." *See* CX-29 at 17. It further describes the input to the inverse scanning process as a "list of 16 values." *Id.* at 179-80; Drabik Tr. 630. And the term "array" is understood in mathematics and in general usage to be an arrangement of quantities or collection of numbers. *See, e.g.*, CX-785 at 78-79; Mitzenmacher Tr. 1670.

The positions, or sequence, of the items in the one dimensional array can be represented by a mathematical variable (such as the claimed p=0-15) to indicate order in the set, but the array need not have an index associated with an element of storage memory. Drabik Tr. 447-448. A person of ordinary skill would thus understand the term "one dimensional array," as used in the '094 patent, to mean a set of values arranged in a single dimension—*i.e.*, in a single column or row. Drabik Tr. 447.

Microsoft argues that the claim term "one dimensional array" must be construed as a specific data structure having certain characteristics—such as numbering, cells, indexing, type and length. Microsoft relies on extrinsic evidence RX-227, a book titled "Data Structures and Algorithms in Java." This book describes an array as follows:

> An ***array*** is a numbered collection of variables all of the same type. Each variable, or ***cell***, in an array has an ***index***, and the cells in an array are numbered consecutively starting with 0 and going to $N - 1$, where N is the ***length*** of the array, which is also known as its **capacity**. Any index not in the range from 0 to $N - 1$ is said to be ***out of bounds***.

RX-227 at 32 (emphases in original).

However, these characteristics are not required by the '094 patent. Indeed, neither the word "index" nor the concept of an indexing data structure is found in the '094 patent. As indicated above, the term "one dimensional array" simply connotes a set

of values arranged in a single column or row.

Further, Dr. Mitzenmacher ultimately agreed that (1) the '094 patent's statement of the technical field of the invention does not mention computer programming or data structures;

(2) the 094 patent's discussion of what was needed in the art is not limited to encoders or decoders designed using any particular programming language; and (3) video compression discussed in the '094 patent includes hardware implementations, and is not limited to general-purpose processing devices programmed with software. Mitzenmacher Tr. 1651-53, 1752-53. Indeed, Microsoft's expert could not identify any mention of a programming language in the '094 patent. Mitzenmacher Tr. 1652-54.

Moreover, nothing in the claim language or description of the '094 patent excludes decoder implementations that use hard-wired logic—and not a computer program—to implement inverse scanning. Nothing in the claim language or description of the '094 patent requires that the coefficients of a one dimensional array be stored in or accessed from computer memory using data structures defined by high-level programming languages like C++, C or Java. Indeed, the H.264 decoder in the Sigma Designs system-on-chip in the VIP12XX (discussed below) is a hardware design.

2. "two dimensional array" (claims 7, 8, 10); "two dimensional array of frequency coefficients" (claims 7, 8, 10)

Claim Term	Motorola's Proposed Construction	Microsoft's Proposed Construction

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"two dimensional array" (claims 7, 8, 10)	a set of items arranged in rows and columns	a two-dimensional, numbered collection of variables all of the same type where each variable, or cell, in the array has a pair of indexes, with the first index commonly referring to the row and the second index to the column of the cell and with one index numbered consecutively starting with 0 and going to N-1, where N is the length of the rows and the other index numbered consecutively starting with 0 and going to M-1, where M is the length of the columns
"two dimensional array of frequency coefficients" (claims 7, 8, 10)	a set of frequency coefficients arranged in rows and columns	a two-dimensional, numbered collection of frequency coefficients where each cell in the array has a pair of indexes, with the first index commonly referring to the row and the second index to the column of the cell and with one index numbered consecutively starting with 0 and going to N-1, where N is the length of the rows and the other index numbered consecutively starting with 0 and going to M-1, where M is the length of the columns

The claim term "two dimensional array" appears in the first element of claims 7, 8, and 10. JX-9 at col. 17, ln. 44 – col. 19, ln. 31; col. 20, ln. 31 – col. 22, ln. 13.[51]

Motorola construes the term to mean "a set of items arranged in rows and columns." Compls. Br. at 71. Microsoft construes the term to mean "a two-dimensional, numbered collection of variables all of the same type where each variable, or cell, in the array has a pair of indexes, with the first index commonly referring to the row and the second index to the column of the cell and with one index numbered consecutively starting with 0 and going to N-1, where N is the length of the rows and the other index numbered consecutively starting with 0 and going to M-1, where M is the length of the columns." RX-394 at 5.

[51] The claim term also appears in non-asserted claims. JX-9.

PUBLIC VERSION

As proposed by Motorola, the claim term "two dimensional array" is construed to mean "a set of items arranged in rows and columns."

The claim term "two dimensional array of frequency coefficients" appears in the first element of claims 7, 8, and 10. JX-9 at col. 17, ln. 44 – col. 19, ln. 31; col. 20, ln. 31 – col. 22, ln. 13.[52]

Motorola construes the term to mean "a set of frequency coefficients arranged in rows and columns." Compls. Br. at 71. Microsoft construes the term to mean "a two-dimensional, numbered collection of frequency coefficients where each cell in the array has a pair of indexes, with the first index commonly referring to the row and the second index to the column of the cell and with one index numbered consecutively starting with 0 and going to N-1, where N is the length of the rows and the other index numbered consecutively starting with 0 and going to M-1, where M is the length of the columns." RX-394 at 6.

As proposed by Motorola, the claim term "two dimensional array of frequency coefficients" is construed to mean "a set of frequency coefficients arranged in rows and columns."

The '094 patent refers to a two-dimensional (also "2-D") array as having columns and rows. JX-9 at col. 3, lns. 41-51. In the two-dimensional array, each item (frequency coefficient) has defined relationships in two-dimensions: to its neighbors in the same column and to its neighbors in the same row. The dimensionality of the array is derived from the relationships among its elements. CX-706C (Drabik WS) at 71-74; Drabik Tr. 620-27.

[52] The claim term also appears in non-asserted claims. JX-9.

The relationships among the elements of a 2-D array can be represented with columns and rows and two variables. The '094 patent uses variables labeled "n" and "m" to identify the relative locations of frequency coefficients in an array corresponding to a block of pixels. The variables n and m simply represent column and row numbers, respectively. JX-9 at col. 8, ln. 57-col. 9, ln. 5. The row and column numbers provide a reference for listing scanning order numbers and corresponding locations in 2-D space. JX-9 at col. 9, lns. 12-43. *See also* CX-29 180 at Table 8-13.

Microsoft agrees that the items in a 2-D array are arranged in rows and columns. However, as with the claim term "one dimensional array," Microsoft's proposed construction for "two dimensional array" adds additional requirements about numbering, cells, indexing, type and length that are based on extrinsic evidence of how the information in a 2-D array is stored and accessed in some computer languages.

Digital video content can be "represented" in a 2-D array, as required by the '094 patent claims, without being accessed or stored in the restrictive fashion required by Microsoft's proposed construction. Regardless of whether one accesses the elements of a two-dimensional array in a computer program with one index or two indices, the positions of all of the elements of the array are specified relative to one another in two dimensions, and are represented in columns and rows, each represented by a variable. This is different than a one-dimensional array, in which the elements relate to one another only in one dimension.

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3. "wherein the one dimensional array of frequency coefficients is represented by a variable p=0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, or 15" (claims 8, 10)

Claim Term	Motorola's Proposed Construction	Microsoft's Proposed Construction
"wherein the one dimensional array of frequency coefficients is represented by a variable p=0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, or 15" (claims 8, 10)	the position of a frequency coefficient in the one dimensional array is represented by a variable p that can be 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, or 15	the "one dimensional array of frequency coefficients" has values at locations identified by a variable p set to each number from 0 to 15, inclusive

The claim term "wherein the one dimensional array of frequency coefficients is represented by a variable p=0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, or 15" appears in the preamble of claims 8 and 10. JX-9 at col. 18, ln. 37 – col. 19, ln. 31; col. 20, ln. 31 – col. 22, ln. 13.[53]

Motorola construes the term to mean "the position of a frequency coefficient in the one dimensional array is represented by a variable p that can be 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, or 15." Compls. Br. at 73. Microsoft construes the term to mean "the 'one dimensional array of frequency coefficients' has values at locations identified by a variable p set to each number from 0 to 15, inclusive." RX-394 at 6.

As proposed by Motorola, the claim term "wherein the one dimensional array of frequency coefficients is represented by a variable p=0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, or 15" is construed to mean "the position of a frequency coefficient in the one dimensional array is represented by a variable p that can be 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, or 15."

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[53] The claim term also appears in non-asserted claims. JX-9.

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The dispute over this language is an extension of the dispute over whether one-dimensional array should be defined as a fixed size (*i.e.*, 16 memory cells) structure for storing and accessing data in computer memory, with each array element having a storage location accessible by a sequential index.

First, the plain language of the claim shows that the one dimensional array of frequency coefficients is <u>represented by</u> one of the 16 "p" variables. The "represented by" language of the claim is indeed broader than Microsoft's proposed language "has values at locations identified by," which requires physical locations in a "one dimensional array."

A person of ordinary skill in the art would understand that the variable "p" refers to the position of a frequency coefficient in the claimed 1-D array. Specifically, the claims of the '094 patent refer to a "one dimensional frequency coefficient" as "being located at p=[]." This is the position of the frequency coefficient in the 1-D sequence that results from the scanning order used during encoding. *See* JX-9 at col. 9, lns. 22-42 (Table 2).

Microsoft's proposed construction imposes requirements on how the claimed 1-D array is stored, such as that a fixed space or fixed number of entries in memory must be present. In particular, Microsoft argues that the locations to which variable p refers must be 16 memory locations. As indicated above, the plain language of the claim only requires that the one dimensional array of frequency coefficients be <u>represented by</u> one of the 16 "p" variables.

Consistent with the claim language, the '094 patent simply refers to the numbers 0-15 in FIG. 6 as labels based on the order of coefficients in a scanning path. JX-9 at col.

9, lns. 12-22. This order is preserved when the coefficients in the 1-D array are encoded using run-level coding to eliminate the processor and memory inefficiencies that otherwise might be caused by storing frequency values that are zero. JX-9 at col. 8, lns. 26-37.[54] Encoding the coefficients of the 1-D array into a sequence of run-level pairs (or position-level pairs) does not change or eliminate the locations of any of the coefficients in the 1-D array, whether the value of the coefficient is zero or non-zero, stored or not stored.

4. "scans the one dimensional array of frequency coefficients in a scanning order p starting at 0 and ending at 15, consecutively" (claim 7)

Claim Term	Motorola's Proposed Construction	Microsoft's Proposed Construction
"scans the one dimensional array of frequency coefficients in a scanning order p starting at 0 and ending at 15, consecutively" (claim 7)	maps the one dimensional array of frequency coefficients in a scanning order p starting at 0 and ending at 15, consecutively	iterates through the one dimensional array of frequency coefficients from a position in the array represented by p=0 and continuing through consecutive positions up to p=15

The claim term "scans the one dimensional array of frequency coefficients in a scanning order p starting at 0 and ending at 15, consecutively" appears in the first element of claim 7. JX-9 at col. 17, ln. 44 – col. 18, ln. 36.

Motorola construes the term to mean "maps the one dimensional array of frequency coefficients in a scanning order p starting at 0 and ending at 15, consecutively." Compls. Br. at 74. Microsoft construes the term to mean "iterates

[54] As explained in the '094 patent, "run-level" pairs are an encoding of the frequency coefficients of a 1-D array into pairs of non-zero frequency coefficient values and the numbers of zeroes between them. *Id.*

through the one dimensional array of frequency coefficients from a position in the array represented by p=0 and continuing through consecutive positions up to p=15." RX-394 at 7.

As proposed by Motorola, the claim term "scans the one dimensional array of frequency coefficients in a scanning order p starting at 0 and ending at 15, consecutively" is construed to mean "maps the one dimensional array of frequency coefficients in a scanning order p starting at 0 and ending at 15, consecutively."

Again, the dispute over this language is an extension of the dispute about whether a 1-D array should be defined as a fixed size structure for storing and accessing data in computer memory.

The word "scans" is used in claim 7 to refer to the conversion between a 1-D array and a 2-D array. This conversion is a mapping function, as demonstrated by the subsequent elements of the claims assigning values to locations in the 2-D array based on the positions of those values in the 1-D array. CX-706C (Drabik WS) at 79-80. Accordingly, Motorola proposes to construe "scans" as "maps."

Motorola's construction is supported by the specification of the '094 patent. In the encoding context (decoding would be the inverse), the specification discloses examples wherein scanning defines the relationship (i.e., the mapping) between a 1-D and 2-D array. JX-9 at col. 3, lns. 45-51, col. 4, lns. 3-10. Furthermore, documents relating to the H.264 Standard, which is incorporated by reference, explicitly equate scanning with mapping. The H.264 Standard itself states: "This subclause specifies

inverse scanning processes; *i.e.*, the mapping of indices to locations…." CX-29 at 25.[55] The H.264/AVC Drafting Guide (v9) also defines "scan" as "mapping." CX-178C at MOTM_ITC 0179257 ("A scan is a mapping from 2-D to 1-D. An inverse scan is a mapping from 1-D to 2-D.").[56]

Microsoft's proposed construction is inappropriate because it limits scanning to a particular computational technique of storing each element of the 1-D array, including coefficients that are zero, in memory and accessing that memory once for each of the elements in the array. The '094 patent does not require an array having a fixed space in computer memory, *e.g.*, an array can be specified using run-level pairs. JX-9 at col. 8, lns. 28-37.

5. "assigning the two dimensional frequency coefficient located at n=[ ] and m=[ ] a value of the one dimensional frequency coefficient located at p=[ ]" (claims 7, 8, 10); a value of the one dimensional frequency coefficient located at p=[ ]" (claims 7, 8, 10)

Claim Term	Motorola's Proposed Construction	Microsoft's Proposed Construction

[55] Microsoft argues that it is improper to base claim construction on the H.264 Standard, on the theory that a claim cannot be construed by relying on an accused device as extrinsic evidence. Here, however, the '094 patent points to the H.264 Standard as providing context for the claimed inventions.

[56] *See also* Joint Final Committee Draft of H.264 Standard, CX-137 at 4 ("raster scan" is a "[a] mapping of a rectangular two-dimensional pattern to a one-dimensional pattern….").

"assigning the two dimensional frequency coefficient located at n=[ ] and m=[ ] a value of the one dimensional frequency coefficient located at p=[ ]" (claims 7, 8, 10)	setting the value of the two dimensional frequency coefficient located at n=[0-3] and m=[0-3] to the value of the frequency coefficient located at position p=[0-15]	copying the coefficient value located in the one dimensional frequency array located at position [0-15] to the two dimensional array at location n=[0-3] and m=[0-3]
"a value of the one dimensional frequency coefficient located at p=[ ]" (claims 7, 8, 10)	a value of the frequency coefficient located at a position p in the one dimensional array	the frequency coefficient stored in the "one dimensional array of frequency coefficients" at the [0-15th] location

The claim term "assigning the two dimensional frequency coefficient located at n=[ ] and m=[ ] a value of the one dimensional frequency coefficient located at p=[ ]" appears in the second through the seventeenth elements of claims 7, 8, and 10. JX-9 at col. 17, ln. 44 – col. 19, ln. 31; col. 20, ln. 31 – col. 22, ln. 13.[57]

Motorola construes the term to mean "setting the value of the two dimensional frequency coefficient located at n=[0-3] and m=[0-3] to the value of the frequency coefficient located at position p=[0-15]." Compls. Br. at 76. Microsoft construes the term to mean "copying the coefficient value located in the one dimensional frequency array located at position [0-15] to the two dimensional array at location n=[0-3] and m=[0-3]." RX-394 at 7.

As proposed by Motorola, the claim term "assigning the two dimensional frequency coefficient located at n=[ ] and m=[ ] a value of the one dimensional frequency coefficient located at p=[ ]" is construed to mean "setting the value of the two dimensional frequency coefficient located at n=[0-3] and m=[0-3] to the value of the

[57] The claim term also appears in non-asserted method claims 5 and 6. JX-9.

frequency coefficient located at position p=[0-15]."

This dispute is yet another extension of the dispute about whether a 1-D array should be defined as a fixed size structure for storing and accessing data. This time Microsoft seeks to require that every coefficient in the one-dimensional array must be accessed from computer memory and copied into a new memory location.

The disputed term "assign" has various ordinary meanings depending on context. When used in the context of a value and a location in an array, as in the claims, a person of ordinary skill in the art would understand "assigning" to take on the ordinary meaning of fixing or specifying the correspondence or relationship between the value and the location. CX-706C (Drabik WS) at 81-82. This meaning is supported by Table 2 of the '094 patent, which "lists the frequency coefficient scanning order and the corresponding values for n and m." JX-9 at col. 9, lns. 21-22. Indeed, there is nothing in the '094 patent that suggests using the term "assigning" in a way that is different from its ordinary meaning.

There are various ways in which a value of a location in an array can be set, and the '094 patent specification does not specify that a particular computational implementation be used. The '094 patent invention relates instead to the scanning path that creates the one-to-one correspondence between the values of a one-dimensional array and a two-dimensional array.

Microsoft's proposed construction erroneously limits assigning to "copying." Copying is only one way of assigning values to locations of an array. Thus, "assigning" may include copying, but does not require copying. The extrinsic definitions cited by Microsoft ("assignment operator," "assignment statement") are computer programming

terms not used in the '094 patent, and even they do not mention copying. RRX-7C (Mitzenmacher RWS) at 104-05. A value can be assigned by default or through computation — it does not have to be copied. Mitzenmacher Tr. 1695. Further, the '094 patent does not require an array having a fixed space in memory. For example, an array can be specified without storing all elements by using run-level pairs. JX-9 at col. 8, lns. 28-37.

The parties also dispute the meaning of the claim term "a value of the one dimensional frequency coefficient located at p=[ ]," which is a portion of the longer term construed above.

Motorola construes this term to mean "a value of the frequency coefficient located at a position p in the one dimensional array." Compls. Br. at 77. Microsoft construes the term to mean "the frequency coefficient stored in the "one dimensional array of frequency coefficients" at the [0-15th] location." RX-394 at 7.

As proposed by Motorola, the claim term "a value of the one dimensional frequency coefficient located at p=[ ]" is construed to mean "a value of the frequency coefficient located at a position p in the one dimensional array," based on the plain meaning of the claim language.

As indicated above, Microsoft's proposed construction is too narrow because it imposes a particular implementation based on storing all of the frequency coefficients of an array, including zero values. The '094 patent does not require an array having a fixed space in computer memory.

6. "generator that produces a representation of the digital video content in a two dimensional array of frequency coefficients" (claim 8)

Claim Term	Motorola's Proposed Construction	Microsoft's Proposed Construction
"generator that produces a representation of the digital video content in a two dimensional array of frequency coefficients" (claim 8)	portion of the decoder that produces a representation of the digital video content in a two dimensional array of frequency coefficients	*This term is invalid and not subject to construction*

The claim term "generator that produces a representation of the digital video content in a two dimensional array of frequency coefficients" appears in the first element of claim 8. JX-9 at col. 18, ln. 37 – col. 19, ln. 31.

Motorola construes the term to mean "portion of the decoder that produces a representation of the digital video content in a two dimensional array of frequency coefficients." Compls. Br. at 78. Microsoft argues that this term is invalid and not subject to construction. RX-394 at 8.

As proposed by Motorola, the claim term "generator that produces a representation of the digital video content in a two dimensional array of frequency coefficients" is construed to mean "portion of the decoder that produces a representation of the digital video content in a two dimensional array of frequency coefficients."

Motorola's proposed construction is supported by the specification of the '094 patent. JX-9 at col. 3, lns. 45-48 ("The encoder generates the one dimensional array..."). In addition, FIG. 5 depicts an embodiment of transform domain coding in which block 502 converts quantized frequency coefficients from a two-dimensional array to a one-dimensional array. JX-9 at col. 8, lns. 20-23.

In the context of a decoder, a portion of the decoder corresponding to block 502 generates the two-dimensional array of frequency coefficients. For the decoding operations, the arrows of FIG. 5 are reversed, *i.e.*, the decoding operations proceed in reverse order from right to left—entropy decoding, inverse scan, inverse quantization, and inverse transform. That a decoder reverses the operations of the encoder was well understood in the art, and did not need to be explained in the '094 patent. CX-719C (Drabik RWS) at 106-08. For example, the prior art Puri patent (CX-125) cited by the Examiner during prosecution of the '094 patent illustrates and confirms this known principle. *See, e.g.*, FIGS. 2 and 4 of CX-125, which show an encoder and decoder, respectively, and the accompanying description, which provides *inter alia* that the decoder "reverses the operations performed by the transform encoder." CX-125 at col. 2, ln. 45 – col. 3, ln. 57. Accordingly, the explanation of the encoding operations in the '094 patent specified the decoding operations as well.

In the art of video coding, the word "generator" describes structure. The structure it describes is electronic hardware, which can be a circuit designed to perform a particular function or a programmable device programmed with firmware or software to perform the function, such as a CPU. Drabik Tr. 478. Normally, the function of the "generator" is specified by other language, as is the case here, where the term provides that the claimed generator "produces a representation of the digital video content in a two dimensional array of frequency coefficients . . ." An example of prior use of the word "generator" to refer to structure in a video coding context can be seen in the cited prior art reference U.S. Patent No. 5,504,530 (Obikane). Obikane disclosed a coding apparatus including an "EOB generator." CX-115, FIGS. 1(c) and 18(c), and col. 23, lns. 61-63.

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7. **"a scanner that scans the one dimensional array of frequency coefficients in a scanning order p starting at 0 and ending at 15, consecutively" (claim 7)**

Claim Term	Motorola's Proposed Construction	Microsoft's Proposed Construction
"a scanner that scans the one dimensional array of frequency coefficients in a scanning order p starting at 0 and ending at 15, consecutively" (claim 7)	portion of the decoder that maps the one dimensional array of frequency coefficients in a scanning order p starting at 0 and ending at 15, consecutively	*This term is invalid and not subject to construction*

The claim term "a scanner that scans the one dimensional array of frequency coefficients in a scanning order p starting at 0 and ending at 15, consecutively" appears in the first element of claim 7. JX-9 at col. 17, ln. 44 – col. 18, ln. 36.

Motorola construes the term to mean "portion of the decoder that maps the one dimensional array of frequency coefficients in a scanning order p starting at 0 and ending at 15, consecutively." Compls. Br. at 79. Microsoft argues that this term is invalid and not subject to construction. RX-394 at 8.

As proposed by Motorola, the claim term "a scanner that scans the one dimensional array of frequency coefficients in a scanning order p starting at 0 and ending at 15, consecutively" is construed to mean "portion of the decoder that maps the one dimensional array of frequency coefficients in a scanning order p starting at 0 and ending at 15, consecutively."

As discussed with respect to construction of "scans" above, the scan pattern of FIG. 6 described in the '094 patent applies equally to the encoder and the decoder. JX-9 at col. 3, lns. 40-51. Reversal of the scanning operation for decoding was well

understood in the art, as discussed above. Accordingly, the explanation of the encoding operations in the '094 patent specified the decoding operations as well.

As with the word "generator," the word "scanner" describes a structure. The structure it describes is electronic hardware, which can be a circuit designed to perform a particular function or a programmable device programmed with firmware or software to perform the function, such as a CPU. Drabik Tr. 479-480. Normally, the function of the "scanner" is specified by other language, as is the case here, where the claim provides inter alia that the claimed scanner "scans the one dimensional array of frequency coefficients in a scanning order p starting at 0 and ending at 15, consecutively." Examples of prior use of the word "scanner" to refer to structure in a video coding context can be seen in U.S. Patent 5,500,678 (Puri), CX-125 at col. 10, lns. 41-49, col. 12, lns. 12-16; U.S. Patent No. 5,949,912 (Wu), CX-128, FIG. 1, at col. 3, lns. 8-10; and U.S. Patent 7,813,569 (Ahn et al), CX-816, FIG. 2, at col. 2, lns. 21-41.

B. Infringement Analysis of the '094 Patent

Microsoft argues that it does not directly infringe the '094 patent based on its testing of the Xbox with certain test video clips. Microsoft asserts that Motorola failed to show that Microsoft's test clips possessed the properties necessary to invoke the accused functionality in the allegedly infringing manner and so its evidence of direct infringement is insufficient. Resp. Br. at 177-78.

Microsoft's argument that there is no evidence that its test clips processed 16 non-zero coefficients is irrelevant. The asserted apparatus claims are not limited to a device that scans 16 non-zero coefficients. Also, all that must be shown for infringement is that the Xbox has the claimed structural capabilities of the '094 apparatus claims. *See*

Mitzenmacher Tr. 1692-1693. Microsoft's argument is rejected.

Microsoft also argues that Motorola improperly relies on the H.264 specification (CX-29) as evidence of infringement. Resp. Br. at 178. Microsoft argues that use of the H.264 Standard as evidence is improper because it only prescribes inputs and outputs. *Id.* However, the Standard requires that "[e]ach profile specifies a subset of algorithmic features and limits that *shall be supported by all decoders conforming to that profile*. CX-29 at 286 (emphasis added). Microsoft does not deny that they practice the H.264 Standard and that the Standard requires this.

1. Accused Products

Motorola argues that least the following products are accused products: all versions and configurations of the Microsoft Xbox 360 console ("the Xbox") imported into the United States and/or sold after importation into the United States on or after December 17, 2010, including but not limited to the Xbox 360 4GB Console and the Xbox 360 250GB Console. Compls. Br. at 80.

Microsoft does not dispute this.

2. Direct Infringement

For the reasons set forth below, Motorola has shown that Microsoft's accused products directly infringe all asserted claims of the '094 patent.

<u>Claim 8</u>

The preamble of independent apparatus claim 8 recites:

> **A device for decoding digital video content wherein the digital video content is represented in a one dimensional array of frequency coefficients, wherein the one dimensional array of frequency coefficients is**

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represented by a variable p=0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, or 15, the device comprising:

Motorola has established that this claim limitation is satisfied.

The claim term "one dimensional array" has been construed to mean "a set of items arranged in a single column or row." The claim term "one dimensional array of frequency coefficients" has been construed to mean "a set of frequency coefficients arranged in a single column or row."

The claim term "wherein the one dimensional array of frequency coefficients is represented by a variable p=0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, or 15" has been construed to mean "the position of a frequency coefficient in the one dimensional array is represented by a variable p that can be 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, or 15."

The H.264 Standard specifies an inverse scanning process for 4 4 transform coefficients, where the input is a 1-D array. CX-29 at 179 ("Input to this process is a list of 16 values."). In the Microsoft code, this 1-D array is stored in a [

] CX-284C at MS_MOTO_752_0000980729; Mitzenmacher Tr. 1691. [

] CX-706C (Drabik WS) at 95-103, 109, 204-210; Mitzenmacher Tr. 1692.

Microsoft argues that [ ] which Microsoft refers to as [ ] is not the claimed "one dimensional array." This is not correct. As explained above in the claim construction section, the '094 patent is not limited to an "array" in the context of computer science or a particular programming language. A

[ ] is one way to implement a 1-D array. The [

] are the positions *in a 1-D array*.

Microsoft also argues that the Xbox does not have the claimed variable "p."

[

] a level value for each of positions p=0...15. CX-706C (Drabik WS) at 112. Moreover, although the claim does not require 16 nonzero values, Dr. Mitzenmacher admitted that the [

] Mitzenmacher Tr. 1692. When [ ] pairs, [

] will explicitly take on every value from 0 to 15.

The first element of claim 8 recites:

> **a generator that produces a representation of the digital video content in a two dimensional array of frequency coefficients, the two dimensional array of frequency coefficients is represented in columns and rows wherein the columns are represented by a variable n=0, 1, 2, or 3, and the rows are represented by a variable m=0, 1, 2, or 3, further comprising;**

Motorola has established that this claim limitation is satisfied.

The claim term "generator that produces a representation of the digital video content in a two dimensional array of frequency coefficients" has been construed to mean "portion of the decoder that produces a representation of the digital video content in a two dimensional array of frequency coefficients."

The Xbox includes a generator, which is the portion of the H.264 video decoder software running on the XCGPU that produces a representation of the digital video content in a 2-D array according to the claim language. CX-706C (Drabik WS) at 103-110, 204-210; Drabik Tr. 478-479. In the Xbox, the 2-D array of the claim is contained

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in [ ] Drabik Tr. 641; CDX-4C-22. Mathematically,[ ] Drabik Tr. 648-649.

The H.264 Standard specifies that the output of the inverse field scan for 4 4 transform coefficients is a variable containing a 2-D array. CX-29 at 179 ("Output of this process is a variable *c* containing a two-dimensional array of 4x4 values"). Microsoft's corporate representative, Yongjun Wu, confirmed that, in the Xbox, the output of the inverse scan is a 2-D array. CX-646C (Wu Dep. Tr.) at 66.[58]

> Q. In the example we were discussing after the inverse scan pattern is applied, what type of data structure is the output placed into?
> A. The output sign?
> Q. The output of the scan pattern.
> A. That is 2-D array.

The Microsoft source code also confirms that a 2-D array stored in [ ] is generated from the 1-D array described above. In the Xbox, this happens in [ ] CX-284C at MS_MOTO_752_0000980729; Drabik Tr. 509. The first time the [ ] representing [ ] CX-706C (Drabik WS) at 107. [ ] For [

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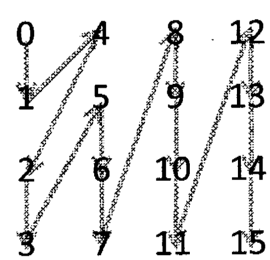
[58] Mr. Wu changed his answer six weeks after the deposition. His new answer was [ ] CX-646C (Wu Dep. Tr. Errata). The [ ] that Mr. Wu *refers to are the "m" and "n" of the claims – the row index and the column index.* Significantly, Mr. Wu did not change his answer from "2-D array" to [ ] until his rebuttal testimony. RRX-11C (Wu) at 5.

] *Id.* at 108. [ ] specifies the use of the inverse field scan of the H.264 Standard. *Id.* [ ] is a location in the 2-D array obtained by mapping with the inverse field scan (using [ ] from the [ ] Mitzenmacher Tr. 1693. Then, the 2-D coefficient value at [ ] CX-706C (Drabik WS) at 107-109.

The inverse field scan is implemented [ ] (below, left). CX-256C at MS-MOTO_752_00000967246. Mitzenmacher Tr. 1685. [ ] RRX-7C (Mitzenmacher RWS) at 133. The highlighted portion of [ ] which follows the same pattern as the inverse field scan illustrated in Figure 8-8(b) of the H.264 Standard (below, right):



See CX-706C (Drabik WS) at 103-106. This scan pattern is the same as in FIG. 6 of the '094 patent. CDX-4C-3 to 15. [ ] is the claimed "generator." CX-706C (Drabik WS) at 103-106.

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Microsoft argues that the Xbox does not have a "two dimensional array" because [ ] However, the dimensionality of an array is not determined by the number of indices used in the source code. Dr. Mitzenmacher admitted that programming languages like MATLAB allow accessing data in a 2-D array [ ] RRX-7C (Mitzenmacher RWS) at 23.

Microsoft also argues that Motorola failed to identify anything in the Xbox source code that corresponds to the "n" and "m" of the claim. This is not correct. As Dr. Drabik explained, [ ] is the n, m variable pair of the claim [ ] Drabik Tr. 526; CX-706C (Drabik WS) at 107-108. [

] Microsoft contends that [ ] However, variable "n=0, 1, 2, or 3" and "m=0, 1, 2, or 3" are not physical structural elements. Instead, they are symbols representative of location in 2-D space (i.e., the columns and rows in the graphically depicted 2-D space of Figure 6 of the '094 patent). Drabik Tr. 473-475, 527. Furthermore, the variables are not separate – they are recited as pairs in the "assigning" limitations of the claims.[59]

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[59] Thus, the variables "n" and "m" are not like the mechanical elements at issue in the *Becton, Dickinson* and *Engel Indus.* cases relied upon by Microsoft. *See* Resp. Br. at 204 (citing *Becton, Dickinson & Co. v. Tyco Healthcare Group, LP*, 616 F.3d 1249, 1254 (Fed. Cir. 2010); *Engel Indus., Inc. v. Lockformer Co.*, 96 F.3d 1398, 1404-05 (Fed. Cir. 1996)).

Microsoft further argues that the Xbox does not have a "generator" because the [ ] However, as discussed above, Dr. Drabik did not identify [ ] alone as the claimed "generator." He also cited [ ] *See, e.g.*, CX-706C (Drabik WS) at 107.

The second through the seventeenth elements of claim 8 recite:

> **assigning the two dimensional frequency coefficient located at n=[ ] and m=[ ] a value of the one dimensional frequency coefficient located at p=[ ]**

Motorola has established that these claim limitations are satisfied.

The claim term "assigning the two dimensional frequency coefficient located at n=[ ] and m=[ ] a value of the one dimensional frequency coefficient located at p=[ ]" has been construed to mean "setting the value of the two dimensional frequency coefficient located at n=[0-3] and m=[0-3] to the value of the frequency coefficient located at position p=[0-15]."

The claim term "a value of the one dimensional frequency coefficient located at p=[ ]" has been construed to mean "a value of the frequency coefficient located at a position p in the one dimensional array."

In compliance with the H.264 Standard, the Xbox assigns a 2-D frequency coefficient located at each of the n, m pairs identified in the claim a value of the 1-D frequency coefficient located at the corresponding position p set forth in the same claim element. CX-706C (Drabik WS) at 110-141, 204-210. The inverse scanning process for 4 4 coefficients is described at §8.5.6. CX-29 at 179-180 (shown in Figure 8-8(b)). As can be seen in Table 8-13, the decoder assigns a 2-D frequency coefficient located at

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(n,m) (labeled in Table 8-13 as subscripts "i, j" of variable "c") = (0,0) the value of the 1-D frequency coefficient located at p (labeled "idx") = 0, and similarly assigns a 2-D frequency coefficient located at each of the other (n, m) pairs a value of a frequency coefficient located at p. CX-29 at 180. When presented with content coded in field mode, the Xbox invokes the field scan decoding functionality specified above. Thumpudi Tr. 1529.

In the Microsoft code, [ ] Wu Tr. 1544. For example, [ ] CX-284C at MS-MOTO_752_0000980729; Drabik Tr. 512-513.

The Xbox assigns each 2-D frequency coefficient located at n=0...3 and m=0...3 a value of the 1-D frequency coefficient located at p=0...15. CX-706C (Drabik WS) at 110-141; CDX-4C-23 to -41, and -48 to -61; Drabik Tr. 527. The Xbox always assigns a value from the 1-D array to each and every location of the 2-D array, [ ] Mitzenmacher Tr. 1695-1696. Each position of the [ ] as was admitted by Microsoft's expert. Mitzenmacher Tr. 1695. In addition, [ ] CX-706C (Drabik WS) at 183, 204-210; Drabik Tr. 483; 633-634.

Microsoft argues that the "assigning" limitations of apparatus claim 8 must be performed in order to infringe, citing cases in which the accused devices did not meet all limitations of the claims until the users modified the device. Unlike the devices at issue in those cases, however, the Xbox's software will *always* produce a 2-D array of 16 coefficients, and therefore will *always* meet all 16 of the "assigning" limitations, when presented with 4 4 field blocks. CX -706C (Drabik WS) at 110-120. It is therefore sufficient that the Xbox includes such software. *Finjan, Inc. v. Secure Computing Corp.*, 626 F.3d 1197, 1205 (Fed. Cir. 2011); *see also Fantasy Sports Props., Inc. v. Sportsline.com, Inc.*, 287 F.3d 1108, 1118-9 (Fed. Cir. 2002). As in *Finjan* and *Fantasy Sports*, the limitations of the asserted claims of the '094 patent are directed to the capabilities of the claimed structures. Claim 8, for example, recites "[a] device *for* decoding" which includes "a generator". The assigning limitations contribute to the structural requirements of the generator.[60]

Microsoft has admitted that it tested the function in the Xbox code that assigns coefficients to [ ] CX-646C (Wu Dep. Tr.) at 44. In addition, there is circumstantial evidence that others use the Xbox to decode H.264 encoded interlaced video (including MBAFF video with 4 4 field blocks), as discussed in connection with the '596 patent. *See* Section II.f.3, *infra*. [ ] are specifically adapted to infringe, and have no non-infringing use. RRX-7C (Mitzenmacher RWS) at 133. Thus, Microsoft is also liable for contributing to and inducing infringement of the

[60] Likewise, claim 7 recites "[a] device *for* decoding" which includes "a scanner." The assigning limitations contribute to the structural requirements of the scanner. Claim 10 also recites structure ("[a] computer readable medium"), and its capabilities.

'094 patent for the same reasons discussed in connection with the '596 patent. *See* Section II.f.3, *infra*.

Claim 10

The preamble of independent apparatus claim 10 recites:

> **A computer readable medium encoded with a computer program used to control a video processor that receives a first signal wherein the first signal is represented in a one dimensional array of frequency coefficients wherein the one dimensional array of frequency coefficients is represented by a variable p=0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, or 15, the computer readable medium controlling the video processor in a method comprising:**

Motorola has established that this claim limitation is satisfied.

The claim term "one dimensional array" has been construed to mean "a set of items arranged in a single column or row." The claim term "one dimensional array of frequency coefficients" has been construed to mean "a set of frequency coefficients arranged in a single column or row."

The claim term "wherein the one dimensional array of frequency coefficients is represented by a variable p=0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, or 15" has been construed to mean "the position of a frequency coefficient in the one dimensional array is represented by a variable p that can be 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, or 15."

The Xbox satisfies the preamble. CX-706C (Drabik WS) at 220-223, 228-232. The Xbox includes a read/write nonvolatile memory with H.264 video decoder software that is loaded into RAM, and which the video processor (XCGPU) executes to decode digital video content in H.264 format. RRX-11C (Wu) 11; CX-706C (Drabik WS) at 222.

The first element of claim 10 recites:

> **generating a two dimensional array of frequency coefficients from the one dimensional array of frequency coefficients, wherein the two dimensional array of frequency coefficients is represented in columns and rows wherein the columns are represented by a variable n=0, 1, 2, or 3, and the rows are represented by a variable m=0, 1, 2, or 3, further comprising;**

Motorola has established that this claim limitation is satisfied.

The claim term "two dimensional array" has been construed to mean "a set of items arranged in rows and columns." The claim term "two dimensional array of frequency coefficients" has been construed to mean "a set of frequency coefficients arranged in rows and columns."

As discussed above, in connection with claim 8, the Xbox H.264 decoder includes a function that generates a 2-D array of frequency coefficients from the 1-D array of frequency coefficients, wherein the 2-D array of frequency coefficients is represented in columns and rows. The columns are represented by a variable n=0, 1, 2, or 3, and the rows are represented by a variable m=0, 1, 2, or 3. CX-706C (Drabik WS) at 224-32.

The second through the seventeenth elements of claim 10 recite:

> **assigning the two dimensional frequency coefficient located at n=[ ] and m=[ ] a value of the one dimensional frequency coefficient located at p=[ ]**

Motorola has established that these claim limitations are satisfied.

The claim term "assigning the two dimensional frequency coefficient located at n=[ ] and m=[ ] a value of the one dimensional frequency coefficient located at p=[ ]" has been construed to mean "setting the value of the two dimensional frequency coefficient

located at n=[0-3] and m=[0-3] to the value of the frequency coefficient located at position p=[0-15]."

The claim term "a value of the one dimensional frequency coefficient located at p=[ ]" has been construed to mean "a value of the frequency coefficient located at a position p in the one dimensional array."

As discussed in the context of claim 8, above, each of the assigning limitations is satisfied by the Xbox decoder. CX-706C (Drabik WS) at 228-32; CDX-4C-23 to -41 and -48 to -61.

Claim 7

The preamble of independent apparatus claim 7 recites:

> **A device for decoding digital video content wherein the digital video content is represented in a one dimensional array of frequency coefficients, the device comprising:**

Motorola has established that this claim limitation is satisfied.

The claim term "one dimensional array" has been construed to mean "a set of items arranged in a single column or row." The claim term "one dimensional array of frequency coefficients" has been construed to mean "a set of frequency coefficients arranged in a single column or row."

The Xbox is a device for decoding digital video content wherein, as discussed in the context of claim 8 above, the digital video content is represented in a one dimensional array of frequency coefficients. CX-189 at MOTM_ITC 0507633-641; CX-706C (Drabik WS) at 243-44, 250-53.

The first element of claim 7 recites:

> **a scanner that scans the one dimensional array of frequency coefficients in a scanning order p starting at 0 and ending at 15, consecutively, to produce a representation of the digital video content in a two dimensional array of frequency coefficients, the two dimensional array of frequency coefficients is represented in columns and rows wherein the columns are represented by a variable n=0, 1, 2, or 3, and the rows are represented by a variable m=0, 1, 2, or 3, further comprising;**

Motorola has established that this claim limitation is satisfied.

The claim term "scans the one dimensional array of frequency coefficients in a scanning order p starting at 0 and ending at 15, consecutively" has been construed to mean "maps the one dimensional array of frequency coefficients in a scanning order p starting at 0 and ending at 15, consecutively." The claim term "a scanner that scans the one dimensional array of frequency coefficients in a scanning order p starting at 0 and ending at 15, consecutively" has been construed to mean "portion of the decoder that maps the one dimensional array of frequency coefficients in a scanning order p starting at 0 and ending at 15, consecutively."

The claim term "two dimensional array" has been construed to mean "a set of items arranged in rows and columns." The claim term "two dimensional array of frequency coefficients" has been construed to mean "a set of frequency coefficients arranged in rows and columns."

The Xbox includes a scanner, which is the portion of the H.264 video decoder software running on the XCGPU. This meets this limitation for the reasons discussed in the context of claim 8. CX-706C (Drabik WS) at 245-53. In addition, the Xbox scanner scans [ ] consecutively. Mitzenmacher Tr. 1691 [

]

The second through the seventeenth elements of claim 7 recite:

> **assigning the two dimensional frequency coefficient located at n=[ ] and m=[ ] a value of the one dimensional frequency coefficient located at p=[ ]**

Motorola has established that these claim limitations are satisfied.

The claim term "assigning the two dimensional frequency coefficient located at n=[ ] and m=[ ] a value of the one dimensional frequency coefficient located at p=[ ]" has been construed to mean "setting the value of the two dimensional frequency coefficient located at n=[0-3] and m=[0-3] to the value of the frequency coefficient located at position p=[0-15]."

The claim term "a value of the one dimensional frequency coefficient located at p=[ ]" has been construed to mean "a value of the frequency coefficient located at a position p in the one dimensional array."

As discussed in the context of claim 8, above, each of the assigning elements is satisfied by the Xbox decoder. CX-706C (Drabik WS) at 249-53; CDX-4C-23 to -41 and -48 to -61.

3. Indirect Infringement

Motorola has not shown that Microsoft's accused products indirectly infringe all asserted claims of the '094 patent.

Motorola argues that Microsoft "contributes to and induces direct infringement by users of the Xbox." Motorola asserts that its infringement claims are based, in part, on the Xbox's implementation of the H.264 Standard. Compls. Br. at 80.

Microsoft argues that Motorola has not established certain required elements of induced infringement and contributory infringement. Resp. Br. at 176-77.

Inducement requires specific intent to encourage another's infringement. *Ricoh*, 550 F.3d at 1341. Generic product usage instructions do not establish intent because the relevant question is whether "instructions teach *an infringing use* of the device such that we are willing to infer from those instructions an affirmative intent to infringe the patent." *Vita-Mix Corp. v. Basic Holding, Inc.*, 581 F.3d 1317, 1329 n.2 (Fed. Cir. 2009) (emphasis added).

Microsoft does not instruct its customers to use the Xbox to watch H.264 interlaced content. Motorola points to Microsoft's generic product usage instructions, including passages showing how Xbox connects to a TV. CX-706C (Drabik WS) at Q448, Q912 (citing CX-182). These instructions do not instruct users to play video that invokes the accused features. RRX-7C (Mitzenmacher RWS) at 87-88, 203-204. Motorola also relies on a Microsoft website that references Xbox's ability to decode H.264 video. CX-706C (Drabik WS) at Q449, 913 (citing CX-179). That website describes H.264 in general, but not the interlaced H.264 content at issue here. RRX-7C (Mitzenmacher RWS) at 88-89, 204-205.

Motorola's allegation of contributory infringement fails because Xbox has substantial non-infringing uses. *Vita-Mix*, 581 F.3d at 1327-1328. None of Xbox's uses that were discussed during the Investigation use the accused features, including video games, (RX-386C (Thumpudi WS) at 2-3), non-H.264 video formats, (RRX-7C (Mitzenmacher RWS) at 88-89, 204-205, citing CX-179), and progressive H.264 content. RX-386 (Thumpudi WS) at 3.

C. Validity of the '094 Patent

Microsoft seeks to invalidate the '094 patent under 35 U.S.C. § 103 based on two combinations of references: RX-297 ("MPEG 91/228") in combination with RX-299 ("JVT-B068"); and RX-293 (MPEG-2 Standard) in combination with RX-299.

For the reasons set forth below, Microsoft has not shown by clear and convincing evidence that the asserted claims of the '094 patent are invalid.

1. MPEG 91/228 (RX-297) Combined with JVT-B068 (RX-299)

MPEG 91/228 discloses four 8 8 scan patterns. RX -297 at 18; Orchard Tr. 1886, 1888. It does not show any scan pattern for a 4 4 block. In his testimony, Dr. Orchard did not address the fact that the 8 8 scans proposed in the MPEG91/228 reference were rejected for the MPEG-2 standard, which suggests that they were not perceived to be useful. Orchard Tr. 1888-89. Dr. Orchard asserts it would have been obvious that one of the 8 8 scans, a vertical scan, would have been a good starting poin t for deriving a 4 4 scan. RX-316C (Orchard WS) at 72-73. However, he presented no evidence to support the vertical scan as a starting point. He also did not identify any reference proposing a 4 4 vertical scan. Orchard Tr. 1896. Thus, Dr. Orchard's proposed 4 4 vertical scan is a speculative hypothetical.

In fact, the two scans that Dr. Orchard proposes to combine teach away from each other and combining them would render both unsuitable for their intended purposes. Specifically, the 8 8 vertical scan in MPEG91/228 is for "non-intra" blocks, whereas the alternate field scan in Fig 2.3(a) of JVT-B068 was proposed for the exact opposite kind of source material, an intra-coded macroblock. RX-299.003. Furthermore, JVT-B068 was crafted over a decade after MPEG91/228, and was for a different standard.

Specifically, JVT–B068 discloses the use of 4 4 blocks because it proposed a modification to the H.26L specification, which was based on 4 4 transforms. RX-299.0003; Orchard Tr. 1891. In contrast, MPEG 91/228 discloses a scan pattern for 8 8 blocks because MPEG-2 was based on 8 8 transforms. RX -297 at 18; CX-719C (Drabik RWS) at 88; Drabik Tr. 2399. 8 8 and 4 4 scan patterns are not related in the simple way asserted by Dr. Orchard. CX-719C (Drabik RWS) at 81-82. Dr. Orchard did not take any of these important differences into account in his analysis. Orchard Tr. 1889-93, 1897.

It is impermissible hindsight analysis, to suggest that a person of ordinary skill in the art would have been guided by these references to try the claimed scanning path of the '094 patent or would somehow be motivated to combine their teachings. There is no evidence that any person of ordinary skill in the art knew of the existence of a "finite number of identified, predictable solutions" including the claimed scanning path. *KSR*, 550 U.S. at 402-03. Microsoft points to testing by the inventors of various scan patterns, including the claimed scan pattern, as evidence of the obviousness of their invention, but the inventors' work was not in the prior art. The fact that the authors of JVT-B068 arrived at a different 4 4 scanning path after te sting is evidence that the claimed scan pattern was not one of a "finite number of identified, predictable solutions." Finally, the alternate 4 4 scan pattern of the JVT -B068 reference was labeled prominently as a prior art scan in FIG. 1 of the '094 patent, and the reference itself was disclosed by the applicants to the Patent and Trademark Office during prosecution of the '094 patent, and the Patent Examiner allowed the issued claims over this reference. JX-9 at FIG. 1.

In addition, even if a person of ordinary skill were to combine the references, he or she would not be in possession of a generator that satisfies the "assigning" limitations of claim 8. In an attempt to overcome this deficiency, Dr. Orchard opines that a person of ordinary skill in the art would create a hypothetical 4 4 vertical scan pattern from the 8 8 vertical scan of MPEG91/228 and then modify that scan by selectively rearranging part of the scan to look like part of a scan in the JVT-B068. RX-316C (Orchard WS) at 87-88. But Dr. Orchard fails to explain why a person of ordinary skill in the art would look to combine a vertical scan designed for non-intra blocks with one designed for intra blocks, instead of combining intra scans together and non-intra scans together. Nor does he explain why a person of ordinary skill in the art would assume that the distribution of energy among a block of coefficients was the same for the 4 4 transforms of H.26L as for the 8 8 transforms of MPEG 91/228. CX -719C (Drabik RWS) at 87. JVT-B068 also teaches away from MPEG91/228 because MPEG 91/228 teaches a vertically-oriented scan pattern that proceeds only from *top to bottom* and only from *left to right*, whereas JVT-B068 teaches a pattern that moves *right to left* from position 3 to position 4, moves *horizontally* from position 5 to position 6, and moves up from *bottom to top* from position 6 to position 7. CX-719C (Drabik RWS) at 89.

Moreover, a person of ordinary skill would not know *a priori* how altering a scan pattern piecemeal would affect performance, and therefore would not know that swapping the order of three coefficients would necessarily improve performance for a suite of test video sequences; this is why scanning patterns are tested *in situ*. CX-719C (Drabik RWS) at 89; Wang Tr. 391. The only apparent basis for Dr. Orchard's analysis is the '094 Patent, which he used as a template for piecing together a 4 4 scan from parts

of two scans designed for mutually exclusive applications: a vertical non-intra 8 8 scan and an intra 4 4 scan. A person of ordinary skill in the art would need to consider the scan pattern as a whole. Dr. Limin Wang, inventor of the '094 patent, confirmed that it was not obvious to try the claimed scan pattern. Significant testing and statistical analysis was required. Wang Tr. 393-394. Thus, the combination by Dr. Orchard based on the '094 patent itself is improper because it relies on impermissible hindsight. CX-719C (Drabik RWS) at 89.

For the reasons discussed above, the combination of MPEG 91/228 with JVT-B068 does not disclose claims 7 and 10. CX-719C (Drabik RWS) at 91-93.

2. MPEG-2 Standard (RX-293) Combined with JVT-B068 (RX-299)

The combination of JVT-B068 with the MPEG-2 Standard would not have rendered obvious asserted claims 7, 8 and 10 of the '094 patent, either. The MPEG-2 Standard discloses an 8 8 scan pattern. During prosecution, the Examiner cons idered the same exact 8 8 scan pattern – it was disclosed in U.S. Patent 5,500,678 to Puri – and allowed the '094 claims. CX-125; JX-10 at MOTM_ITC 0001953. The Examiner issued the '094 patent claims over the MPEG-2 8 8 scan pattern in Puri. JVT -B068 was also disclosed by the applicants to the Patent and Trademark Office during the prosecution of the '094 patent, and the Patent Examiner issued the '094 patent over this reference.

The combination of MPEG-2 and JVT-B068 does not disclose claim 8. The combination of MPEG-2 with JVT–B068 does not render these elements obvious at least because JVT–B068 teaches away from MPEG-2. Drabik Tr. 2397, 2399. Specifically, JVT–B068 discloses the use of 4 4 blocks because it proposed a modification to the

H.26L specification, which was based on 4 4 transforms. RX -0299.003; Orchard Tr. 1891. In contrast, MPEG-2 discloses a scan pattern for 8 8 blocks be cause MPEG-2 was based on 8 8 transforms. CX -719C (Drabik RWS) at 96-97; Drabik Tr. 2399. 8 8 and 4 4 scan patterns are not related in the simple way asserted by Dr. Orchard. CX -719C (Drabik RWS) at 81-82.

Even assuming that a person of ordinary skill in the art was motivated to reduce the MPEG-2 alternate scan pattern from 8 8 to 4 4, a person of ordinary skill in the art would still not be motivated to modify JVT–B068 in view of MPEG-2 by re-ordering coefficients 3, 4, and 5, and reversing the positions of 6 and 7, as Microsoft suggests. CX-719C (Drabik RWS) at 97-98. A person of ordinary skill in the art, looking to MPEG-2 for how to modify JVT-B068, would not have known to re-order the coefficients at positions "2," "4," and "5" of JVT-B068 based on the two-step hypothesis Microsoft proposes (that expected energy strictly decreases with increasing scan position and that total expected energies of 2 2 groups of coefficients in the MPEG -2 8 8 scan would have been compared by determining which included uniformly higher scan positions). CX-719C (Drabik RWS) at 98-100. A person of ordinary skill might have reasonably chosen to compare aggregate 2 2 groups of coefficients in many other ways, including ways that would have suggested that positions "2", "4" and "5" all have the same total expected energy. CX-719C (Drabik RWS) at 101-02. Viewed from this perspective, MPEG-2 teaches a person of ordinary skill in the art that the order of positions "2," "4," and "5" of JVT-B068 is unimportant. *Id.* In addition, a person of ordinary skill in the art following Microsoft's technique would be motivated not only to reverse positions "6" and "7" of JVT-B068 (because "7" has a higher total expected

energy than "6") but also to reverse positions "6" and "8" (because "8" also has a higher total expected energy than "6") and positions "11" and "12" (because "12" has a higher total expected energy than "11"). This would lead to an altogether *different* scan pattern than the scan pattern claimed in the '094 patent. CX-719C (Drabik RWS) at 100-02.

Finally, as Dr. Orchard acknowledges, the JVT-B068 reference cites MPEG-2. The authors of JVT-B068 (Sony) were clearly aware of MPEG-2, yet they did not make the modifications that Dr. Orchard suggests. They were led to a *different* scan pattern than the scan pattern claimed in the '094 patent. CX-719C (Drabik RWS) at 102; Orchard Tr. 1903. This shows that the result was not obvious to these skilled artisans.

For the reasons as discussed above, the combination of MPEG-2 and JVT-B068 does not disclose claims 7 and 10. CX-719C (Drabik RWS) at 103-05.

3. Objective Evidence of Non-Obviousness

The objective evidence of non-obviousness in this case shows that the invention in the asserted claims of the '094 patent is not obvious. This evidence includes evidence of long-felt need, prior failure of others, and commercial success.

There was, at the time of the '094 invention, a long-felt need for better video compression. CX-719C (Drabik RWS) at 114-15. This included a long-felt need for better coding tools to compress interlaced video. *Id.* In the 1990's, with the introduction of HDTV and other high resolution standards, there was increasing demand to deliver sufficient video quality at bit rates lower than 2 Mbits/sec. *Id.* Over time, this included a need for a 4 4 scan path that allowed enhanced coding efficie ncy and lower bit rates, particularly for interlaced video. *Id.* The '094 patent states that "there was a need in the art for scanning paths that allow for more compression than do traditional zig-zag

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scanning paths." JX-9 at col. 4, lns. 19-21. The 8 8 zig -zag and alternate scans paths used in the prior standards did not provide sufficient compression for interlaced video. *Id.* Video coding experts also recognized the need for enhanced coding efficiency and lower bit rates. CX-170 at 560 ("an increasing number of sources and growing popularity of high definition TV are creating greater needs for higher coding efficiency"). CX-107 at 1.

The alleged prior art relied upon by Microsoft's expert for the '094 patent demonstrates the failure of others to produce the 4 4 scan of the '094 patent. Despite having the knowledge and experience of at least a person of ordinary skill and the motivation to produce the better scan path, the authors of JVT-B068 did not arrive at the 4 4 scan of the '094 patent, which was optimized for the coding of interlaced video. The authors of JVT-B068 recognized in their submission that "MPEG-2 cannot deliver sufficient video quality at those rates [less than 2 Mbits/sec]." RX-299.0001. They further recognized that the H.26L specification "does not contain scan methods, which provide higher coding efficiency with interlaced sequences." *Id.* Yet, the JVT-B068 authors produced a *different* scan pattern than the '094 inventors.

In May 2002, Motorola submitted to the Joint Video Team its proposal for alternate coefficient scanning patterns. The claimed 4 4 scan of the '094 patent was among the scans submitted. CX-198C at MOTM_ITC_0089797. The JVT-C140 submission contained the results of simulations of Motorola's 4 4 scan which showed "savings over a wide range of bit rates by using the alternate scans over the reference scans for interlaced material." CX-198C at MOTM_ITC_0089801. *See also* CX-719C (Drabik RWS) at 116.

Motorola's scan pattern also earned the praise of others. Sony, the same authors of JVT-068 relied on by Microsoft, verified Motorola's 4 4 scan proposal (JVT -C140) and produced test results showing that Motorola's proposed scan increased coding efficiency. CX-707C (Wang) 11-12, CX-209C; CX-719C (Drabik RWS) at 116-17; Drabik Tr. at 2400. Motorola's proposal for the 4 4 scan, <u>not</u> Sony's proposal, was adopted by the Joint Video Team of video coding experts at the October 2002 meeting in Geneva. Motorola's 4 4 scan was incorporated into the H.264 Standard. CX-707C (Wang) 11-12; CX-719C (Drabik RWS) at 116-17.

4. Written Description Requirement

Microsoft argues that the '094 patent does not contain sufficient description of the decoding inventions of claims 7, 8 and 10 to demonstrate that the inventors were in possession of the claimed inventions at the time of filing. The disclosure in the '094 patent is more than sufficient to satisfy the written description requirement.

<u>"decoding....coefficients" (claims 7, 8)</u>. One of skill in the art would recognize that the inventors possessed the idea of "decoding digital video content wherein the digital video content is represented in a one dimensional array of frequency coefficients," as required by claims 7 and 8. CX-719C (Drabik RWS) at 106. The '094 patent is directed to frequency scanning paths for use in coding digital video content. Coding of digital video content includes both *encoding and decoding*. Drabik Tr. 2379. The TECHNICAL FIELD of the '094 specification states that the "present invention relates to digital video encoding, *decoding*, and bitstream generation. JX-9 at col. 1, lns. 17-18; CX-719C (Drabik RWS) at 106-07.

The specification states that "[t]he N by M array of frequency coefficients is [2-D] and must be converted into a one dimensional array of frequency coefficients so that the *encoder or decoder* can use the frequency coefficients to *encode or decode* the picture." JX-9 at col. 3, lns. 40-45. The specification further indicates that encoding and decoding are complementary processes, where *encoding* is *compressing* digital video content and *decoding* is *decompressing* digital video content. JX-9 at col. 1, ln. 62 – col. 2, ln. 3.

FIG. 5 of the '094 patent discloses the sequence of operations included in the encoding process and indicates the order of the encoding operations from left to right—transform, quantization, frequency coefficient scan, and entropy encoding. As disclosed in the specification, decoding is "decompressing" the encoded (compressed) video data. One of skill in the art would understand from reading the specification that the sequence of the decoding operations is reversed, *i.e.*, the decoding operations proceed in reverse order from right to left: entropy decoding, inverse frequency coefficient scan, inverse quantization, and inverse transform. CX-719C (Drabik RWS) at 106-07.

The '094 patent specification discloses examples of each operation. The specification discloses one method of transform domain coding, and gives an equation for discrete cosine transform (DCT) (JX-9 at col. 7, lns. 21-49)); it discloses an example of quantization (JX-9 at col. 7, ln. 50-col. 8, ln. 20); it discloses the process of run-length coding (JX-9 at col. 8, lns. 28-37); and it discloses entropy coding, context-adaptive binary arithmetic coding (CABAC) (JX-9 at col. 8, lns. 36-41). The specification also discloses that these coding techniques can be used in processes that scan frequency coefficients using the disclosed scan patterns. CX-719C (Drabik RWS) at 107-08.

The specification discloses that "[v]ariable block size transform coding means that the transform domain coding can be performed on blocks of varying sizes. For example, transform domain coding can be performed on 4 by 4 pixel blocks (405) for a particular macroblock...." JX-9 at col. 7, lns. 1-6. In particular, it discloses as an embodiment of the invention, FIG. 6, which shows a preferable scan pattern for a 4 4 pixel block's frequency coefficient array. The specification further discloses in Table 2 the scan pattern for the 4 4 pixel block, with the 1 -D frequency coefficients represented by variable p and the columns and rows of the 2-D frequency coefficients represented by variables n (column) and m (row). JX-9 at col. 9, lns. 11-43. One of ordinary skill would recognize that the inventors of the '094 patent invented using this 4 4 scan for both encoding and decoding processes. CX-719C (Drabik RWS) at 108.

"wherein...variable p" (claims 8, 10). The preamble of claim 8 contains the phrase "wherein the digital video content is represented in a one dimensional array of frequency coefficients wherein the one dimensional array of frequency coefficients is represented by a variable p=0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, or 15." One of skill in the art would recognize that the inventors of the '094 patent invented decoding digital video content wherein the digital video content is represented in a 1-D array of frequency coefficients in the context of the '094 patent. CX-719C (Drabik RWS) at 106-10. Table 2 of the '094 patent describes that coefficients in the 1-D array are labeled 0-15 in accordance with their scanning order. CX-719C (Drabik RWS) at 108.

The preamble of claim 10 contains the phrase "wherein the first signal is represented in a one dimensional array of frequency coefficients wherein the one dimensional array of frequency coefficients is represented by a variable p=0, 1, 2, 3, 4, 5,

6, 7, 8, 9, 10, 11, 12, 13, 14, or 15." As discussed above, one of skill in the art would recognize that the inventors of the '094 patent invented decoding digital video content wherein the first signal is represented in a 1-D array of frequency coefficients in the context of the '094 patent. CX-719C (Drabik RWS) at 106-10.

"a scanner...variable m" (claim 7). Microsoft argues that claim 7 is invalid under the written description requirement because the specification does not sufficiently describe the phrase "a scanner that scans the one dimensional array of frequency coefficients in a scanning order p starting at 0 and ending at 15, consecutively, to produce a representation of the digital video content in a two dimensional array of frequency coefficients, the two dimensional array of frequency coefficients is represented in columns and rows wherein the columns are represented by a variable n=0, 1, 2, or 3, and the rows are represented by a variable m=0, 1, 2, or 3." However, as discussed above, the specification discloses FIG. 6, which provides the 4 4 scan that may be implemented in hardware or software to scan the 1-D array of frequency coefficients according to the language of claim 7. The specification further discloses in Table 2 the scan pattern for the 4 4 pixel block, with the 1 -D frequency coefficients represented by variable p and the columns and rows of the 2-D frequency coefficients represented by variables n (column) and m (row). JX-9 ('094 patent) at col. 9, lns. 11-43. Thus, the patent demonstrates to one of skill in the art that the inventors invented and possessed the idea of a scanner according to the claim language. CX-719C (Drabik RWS) at 111.

"assigning....located at p" (claims 7,8,10). Microsoft argues that these elements are invalid under the written description requirement because the specification does not sufficiently describe the elements "assigning the two dimensional frequency coefficient

located at n=[0-3] and m=[0-3] a value of the one dimensional frequency coefficient located at p=[0-15]." However, when read in light of the specification, one of skill in the art would recognize that the inventors of the '094 patent invented "assigning the two dimensional frequency coefficient located at n=[0-3] and m=[0-3] a value of the one dimensional frequency coefficient located at p=[0-15]" in the context of the '094 patent. The specification discloses in Table 2 the scan pattern for the 4 4 pixel block, with the 1 - D frequency coefficients represented by variable p and the columns and rows of the 2-D frequency coefficients represented by variables n (column) and m (row). JX-9 at col. 9, lns. 11-43. One of ordinary skill would recognize that the inventors of the '094 patent invented the 4 4 scan for assigning the 2 -D frequency coefficient located at n = [0..3] and m = [0..3] a value of the 1-D frequency coefficient located at p = [0...15] in the context of the claims. CX-719C (Drabik RWS) at 112.

<u>"generating…variable m" (claim 10)</u>. Microsoft also argues that the phrase "generating a two dimensional array of frequency coefficients from the one dimensional array of frequency coefficients, wherein the two dimensional array of frequency coefficients is represented in columns and rows wherein the columns are represented by a variable n=0, 1, 2, or 3, and the rows are represented by a variable m=0, 1, 2, or 3" of claim 10 is invalid under the written description requirement. However, as discussed above, the specification discloses FIG. 6, which provides the 4 4 scan pattern that may be used for generating a 2-D array of frequency coefficients from a 1-D array of frequency coefficients. The specification also discloses in Table 2 the scan pattern for the 4 4 pixel block, with the columns and rows of the 2 -D frequency coefficients represented by variables n (column) and m (row). JX-9 at col. 9, lns. 11-43. The

specification further discloses that, in the context of an encoder, "[t]he encoder generates the one dimensional array of frequency coefficients by scanning the two dimensional array of frequency coefficients using a particular scanning path." JX-9 at col. 3, lns. 45-48. One of skill in the art would readily understand from reading the disclosure that generating in the context of a decoder is reversed, that is, the decoder generates the 2-D array of frequency coefficients from the 1-D array of frequency coefficients using a particular scanning path. Thus, the patent demonstrates to one of skill in the art that the inventors invented and possessed the idea of "generating…" according to the claim language. CX-719C (Drabik RWS) at 113.

"generator…variable m" (claim 8). Claim 8 contains the phrase "a generator that produces a representation of the digital video content in a two dimensional array of frequency coefficients, the two dimensional array of frequency coefficients is represented in columns and rows wherein the columns are represented by a variable n=0, 1, 2, or 3, and the rows are represented by a variable m=0, 1, 2, or 3." Microsoft argues that this phrase is invalid under the written description requirement because the specification does not describe it sufficiently. However, as discussed above, the specification discloses the FIG. 6 scan pattern, which is used to produce a representation of the digital video content in a 2-D array of frequency coefficients according to the language of claim 8. The specification further discloses in Table 2 the scan pattern for the 4 4 pixel block, with the 2-D frequency coefficients represented by variables n (column) and m (row). JX-9 at col. 9, lns. 11-43. Thus, the patent clearly demonstrates to one of skill in the art that the inventors invented and possessed the idea of "a generator that produces a representation

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of the digital video content in a two dimensional array of frequency coefficients. . ." according to the language of claim 8. CX-719C (Drabik RWS) at 113.

5. Indefiniteness for Functional Claiming

Microsoft argues that the term "scanner" in claim 7 and "generator" in claim 8 are indefinite for "functional claiming." As discussed above in the claim construction section of this brief, these terms are recognized in the art as connoting structure. There is nothing wrong with having functional limitations associated with these structures. There is also nothing wrong with the terms encompassing broad classes of structures. *Linear Technology Corp. v. Impala Linear et al.*, 379 F.3d 1311, 1319-1321 (Fed. Cir. 2004). When read in light of the specification, it is clear to one of ordinary skill in the art that the terms "scanner" and "generator" mean the hardware or software portion of a decoder that scans in accordance with the claim language. Drabik Tr. 478-80. The '094 patent teaches that applications for video compression are varied, and include various hardware and software implementations. JX-9 at col. 1, lines 26-30; CX-719C (Drabik RWS) at 111-12. Claims 7 and 8, directed to devices for decoding, and including the additional structure connoted by the "scanner" and "generator" terms, are not purely functional.

6. Mixing Method and Apparatus

Microsoft argues that claims 7 and 8 are invalid under Section 112 for claiming both an apparatus and a method of using an apparatus. However, neither claim impermissibly mixes classes of subject matter. Claims 7 and 8 each claim a "device for decoding" that includes a "scanner" or "generator." These scanner and generator structures are described in part by the "assigning" limitations of the claims. The